FUTURE DEMOGRAPHIC AND ECONOMIC TRENDS IN THE CALIFORNIA DESERT

Final Report

October 1978

Prepared for:

California Desert Planning Program
Bureau of Land Management
Riverside California

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SRI Project 6280

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I INTRODUCTION

This report presents projections of economic activity and demographic patterns in the California Desert from the present to 2000. The report is part of a broader research effort by SRI International for the Desert Planning Staff of the Bureau of Land Management (BLM). That project includes several social and economic background studies, which will be used in developing a land-use plan for the California Desert Conversion Area (CDCA). Under Section 601 PL 94-579, the Federal Land Policy and Management Act of 1976, BLM is required to prepare a land-use plan for the CDCA by October 1980. The following chapters present an overview of future trends likely in the California Desert, focusing on major activities and trends.

Historical data for the CDCA can be found in a background report prepared by SRI--"Demographic and Economic Trends in the California Desert" (May 1978).

The projections contained in this report are compiled from other sources for the most part. State and local planning agencies were relied on for population projections; industry and regional economic projections were compiled from a variety of public and private agencies and organizations.

II FUTURE DEMOGRAPHIC TRENDS

This chapter discusses future population changes in the California Desert. We employ the medium population projections in comparing population changes among the California Desert, the Southern California Metropolitan Region, California, Clark, Yuma, Mohave counties, and the United States.

First, we shall examine how desert counties, and the desert as a whole, compare with anticipated population changes between 1970 and 1980. Tables 1 and 2 show that the desert portion of southern California is expected to grow at a slightly slower rate (22%) than the desert counties as a whole (23.5%--see Table 4). The desert increase is high compared with the moderate 14% increase expected in California, and 10%-12% expected in the United States, but low compared with the high 30%-70% population increases expected in Clark, Yuma, and Mohave counties between 1970 and 1980.

The same general trends are expected in the following two decades. The 26% increase expected in the desert is higher than rates for the total desert counties (21.7%), the Metropolitan Region (14.4%), California (15.3%), and the United States (10%-13%) between 1980 and 1990. Growth in Clark, Yuma, and Mohave counties is expected to slow to 27%-38%, still somewhat higher than the desert average. Between 1990 and 2000, the desert rate of change is expected to be at its lowest--19%. Again, this rate is higher than projected increases in the CDCA counties (13.7%), the Metropolitan Region (10.2%), California (11.4%), and the United States (7%-9%), and lower than Clark and Mohave counties (24%-25%).

Age and sex distributions by market area and by county in the CDCA for the years 1980, 1990, and 2000 are given in Appendix A.

The population of the CDCA is expected to increase by 63% or from 472,712 in 1976 to 770,920 in 2000. The greatest change is an anticipated increase of 135,165 between 1980 and 1990.

As shown in Table 2, CDCA population is expected to increase at rates of 19%-26% between 1970 and the year 2000. The largest increase of 26% is projected to occur between 1980 and 1990.

The desert portions of Los Angeles and San Diego counties will witness the greatest increases. Los Angeles County is anticipating a population growth rate of 17% between 1970 and 1980, a jump to 61% between 1980 and 1990, and a subsequent 37% increase between 1990 and 2000. San Diego county is expecting steadier increases of 47%, 37%, and 36% in each 10-year interval.

Table 1

CDCA POPULATION FORECASTS BY COUNTY

	1976	1980	1990	2000
Imperial County	83,800	94,100	113,100	129,000
Desert portion of:				
Inyo	2,850	2,950	3,200	3,600
Kern	48,980	50,800	55,400	60,000
Los Angeles	85,844	89,300	144,000	198,000
Riverside	124,397	141,400	183,500	218,200
San Bernardino	125,441	132,115	146,030	159,120
San Diego	1,400	1,600	2,200	3,000
Total CDCA	472,712	512,265	647,430	770,920

Source: SRI International

Table 2

PROJECTED RATE OF GROWTH
IN CDCA POPULATION BY COUNTY

	1970-1980	1980-1990	1990-2000
Imperial County	26%	20%	14%
Desert portion of:			
Inyo	60	8	12
Kern	13	9	8
Los Angeles	17	61	37
Riverside	37	30	19
San Bernardino	14	11	9
San Diego	47	37	36
Average CDCA	22	26	19

Source: SRI International

Desert portions of Inyo, Kern, and San Bernardino counties expect the least amount of population increase, with rates of 8%-14% in general. The 60% jump in Inyo County between 1970 and 1980 reflects a large increase in a small population base.

Anticipated population changes for the counties in the CDCA are shown in Tables 3 and 4. The high, medium, and low projections were calculated by the California Department of Finance; each projection used a slightly different fertility rate. As Table 4 shows, the population increases vary between 13%-22%. The largest increases are expected in Riverside County between 1975 and 1980, and Riverside, Inyo, and Imperial counties between 1980 and 1990. Low increases are expected in Inyo County between 1975 and 1980, and Kern County between 1990 and 2000.

Forecasts for the market areas in the CDCA (see Figure 1) show steady population increases in all 14 areas (see Table 5). The largest population increase is expected in the Lancaster-Mojave market area, where an increase of 57,300 is shown between 1980 and 1990.

Table 6 shows the anticipated population changes in desert market areas between 1970 and 2000. The most noteworthy increases are expected to occur in East Inyo County (114% between 1970 and 1980), Barstow-Victorville (49% between 1980 and 1990), and Anza Borrega (47% between 1970 and 1980). Small increases of 2% to 12% are expected to occur in Ridgecrest, East Mojave, and Amboy-Needles.

Tables 7 and 8 show projected population and percent changes in population for selected counties in Arizona, Nevada, and all counties in California, and the United States that we used for comparison with the desert region. As can be seen in Table 8, anticipated growth rates are rapid in Clark, Yuma, and Mohave counties, ranging from 25%-78%, with the highest increases occurring between 1970-1980. Projected increases in California are a more moderate 7%-18%, whereas increases for the country as a whole are still smaller--a projected 6%-13%.

Projected population changes in the Southern California Metropolitan Region are shown in Table 9. This area is expected to grow from 12,774,040 in 1980 to 16,106,380 in 2000. Population changes are expected to be the greatest between 1980 and 1990, with a moderate increase of 14.4%.

Table 3

PROJECTED POPULATION OF CDCA COUNTIES

Area		July 1, 1980	July 1, 1990	July 1, 2000
Imperial	High	94,300	118,700	142,900
	Medium	94,100	113,100	129,000
	Low	93,700	110,800	122,200
Inyo	High	18,100	22,600	27,300
	Medium	18,100	22,200	25,800
	Low	17,900	20,100	21,800
Kern	High	379,300	451,500	514,000
	Medium	378,500	437,000	476,000
	Low	376,900	427,800	457,000
Riverside	High	628,200	796,400	934,100
	Medium	626,800	798,400	910,000
	Low	623,100	763,000	842,700
San Bernardino	High	790,700	979,900	1,165,900
	Medium	780,000	938,700	1,084,800
	Low	777,300	913,700	1,022,100
Total	Medium	1,897,500	2,309,400	2,625,600

Sources: 1. For the medium projection, we used California State Department of Finance, "Population Projections for California Counties 1975-2020 with Age/Sex Detail to 2000, Series E-150," Report 77-P-3 (December 1977)

2. For the lower and higher projections, we used material supplied by the California Department of Finance, alternate Series F-75 and D-225, respectively (unpublished)

Table 4

PERCENTAGE GROWTH IN PROJECTED POPULATION OF CDCA COUNTIES

Area		1970-1980	1980-1990	1990-2000
Imperial	High	28.4%	25.9%	20.4%
	Medium	28.1	20.2	14.1
	Low	27.6	18.2	10.3
Inyo	High	17.9	24.9	20.8
	Medium	17.9	22.7	16.2
	Low	16.6	12.3	8.5
Kern	High	16.7	19.0	13.8
	Medium	16.4	15.5	8.9
	Low	15.9	13.5	6.8
Riverside	High	39.6	26.8	14.3
	Medium	39.3	27.4	14.0
	Low	38.5	22.5	10.4
San Bernardino	High	17.6	23.9	19.0
	Medium	16.0	20.3	15.6
	Low	15.6	17.5	11.9
Total	Medium	23.5	21.7	13.7

Sources:
1. For the medium projection, we used California State Department of Finance, "Population Projections for California Counties 1975-2020 with Age/Sex Detail to 2000, Series E-150," Report 77-P-3 (December 1977)
2. For the lower and higher projections, we used material supplied by the California Department of Finance, alternate Series F-75 and D-225, respectively (unpublished)

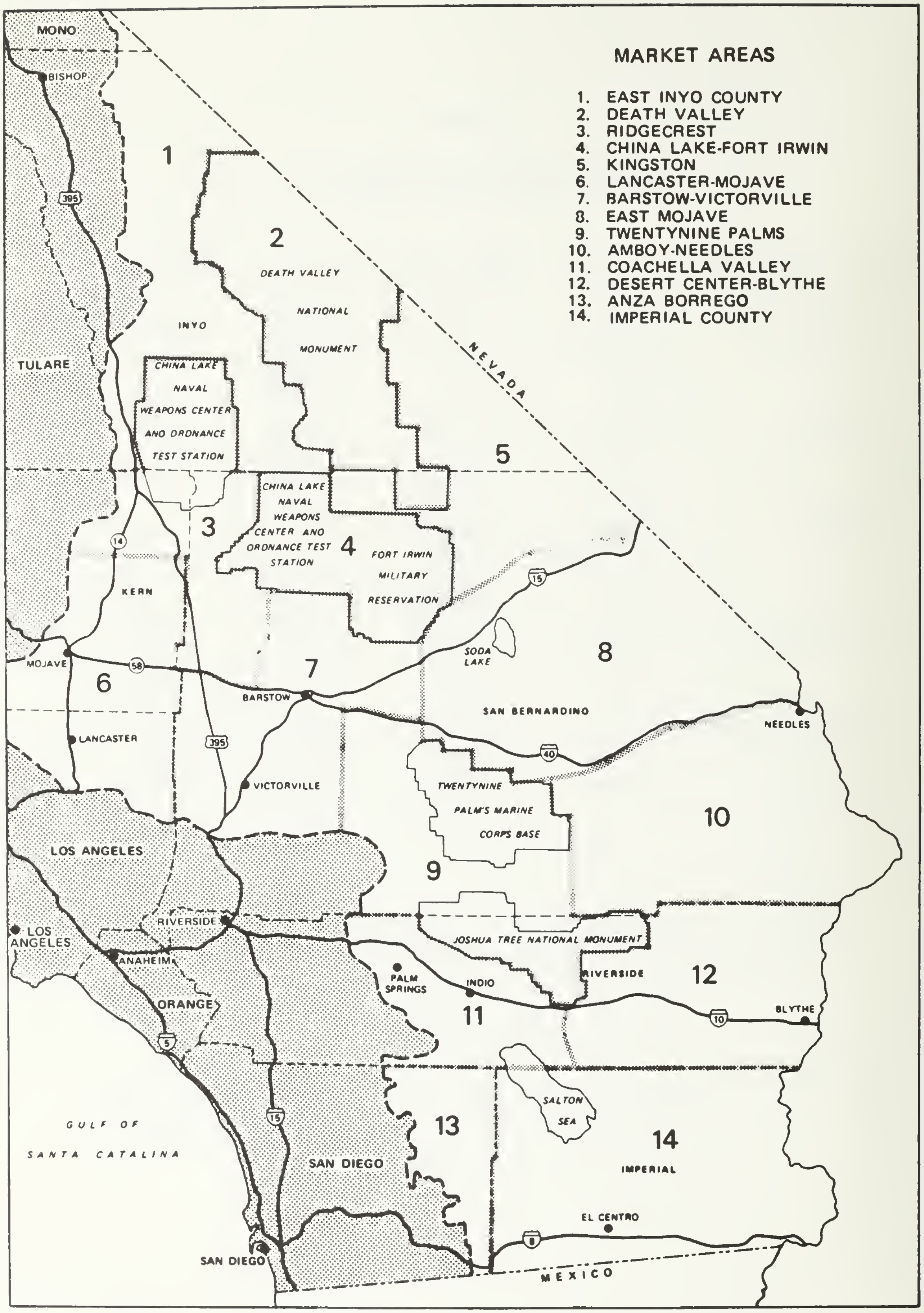

FIGURE 1. MARKET AREAS IN THE CDCA

Table 5

POPULATION FORECASTS FOR MARKET AREAS
AND TOTAL CDCA 1980, 1990 AND 2000

	Market Area	1980	1990	2000
1	East Inyo County	1,600	1,700	1,900
2	Death Valley	650	700	800
3	Ridgecrest	28,500	31,100	33,400
4	Fort Irwin	125	130	160
5	Kingston	990	1,100	1,210
6	Lancaster-Mojave	116,100	173,400	230,000
7	Barstow-Victorville	88,300	98,400	108,100
8	East Mojave	2,500	2,700	2,750
9	Twentynine Palms	27,500	29,400	31,900
10	Amboy-Needles	8,900	10,000	10,500
11	Coachella Valley	124,100	164,500	197,700
12	Desert Center-Blythe	17,300	19,000	20,500
13	Anza Borrega	1,600	2,200	3,000
14	Imperial County	94,100	113,100	129,000
	Total	512,265	647,430	770,920

Source: Compiled by SRI International from Bureau of Census and local planning agency reports

Table 6

PROJECTED PERCENTAGE GROWTH IN POPULATION
OF MARKET AREAS

	Market Area	1970-1980	1980-1990	1990-2000
1	East Inyo County	114%	6%	12%
2	Death Valley	28	8	14
3	Ridgecrest	12	9	7
4	Fort Irwin	-96	4	23
5	Kingston	16	11	10
6	Lancaster-Mojave	16	49	33
7	Barstow-Victorville	15	11	10
8	East Mojave	6	8	2
9	Twentynine Palms	28	7	8
10	Amboy-Needles	5	12	5
11	Coachella Valley	43	33	20
12	Desert Center-Blythe	6	10	8
13	Anza Borrega	47	38	36
14	Imperial County	26	20	14
	Average	22%	26%	19%

Source: SRI International

Table 7

PROJECTED POPULATION OF CLARK, YUMA AND
MOHAVE COUNTIES, CALIFORNIA, AND THE UNITED STATES

Area		1980	1990	2000
	High	460,000	650,000	850,000
Clark, Nevada	Medium	435,000	600,000	750,000
	Low	420,000	560,000	700,000
	High	82,200	104,700	
Yuma, Arizona	Medium	79,300	101,000	N.A.
	Low	76,400	97,300	
	High			
Mohave, Arizona	Medium	43,958	57,305	71,000
	Low			
	High	22,871,600	26,957,200	31,027,000
California	Medium	22,798,900	26,292,000	29,287,000
	Low	22,698,600	25,404,600	27,211,700
United States	High	228,676,000	258,692,000	283,104,000
	Medium			
	Low	224,132,000	246,639,000	262,756,000

Sources: 1. Clark County Regional Planning Council, "Regional Planning Profile" (1976)

2. Yuma County Planning Department, telephone conversation with Mike Gaston June 1978)

3. Mojave County Planning Department, telephone conversation with Michael Wit (June 1978)

4. California State Department of Finance, "Population Projections for California Counties 1975-2020 with Age/Sex Detail to 2000, Series E-150" (December 1977)

5. U.S. Bureau of the Census (September 1975), as reported in the Clark County Regional Planning Council report

Table 8

PERCENTAGE GROWTH IN PROJECTED POPULATION
OF CLARK, YUMA, AND MOHAVE COUNTIES, CALIFORNIA,
AND THE UNITED STATES

Area		1970-1980	1980-1990	1990-2000
	High	78.0%	41.3%	30.8%
Clark, Nevada	Medium	68.4	37.9	25.0
	Low	62.6	33.3	25.0
	High	35.1	27.4	
Yuma, Arizona	Medium	30.4	27.4	N.A.
	Low	25.6	27.4	
	High			
Mohave, Arizona	Medium	70.0	30.4	23.9
	Low			
	High	14.3	17.9	15.1
California	Medium	14.0	15.3	11.4
	Low	13.5	11.9	7.1
United States	High	12.2	13.1	9.4
	Medium			
	Low	9.9	10.0	6.5

Sources: 1. SRI International

2. 1970 population figures used to calculate column 1 are from U.S. Bureau of the Census, "Characteristics of the Population," Part 30, Nevada, and Part 4, Arizona (1970)

Table 9

PROJECTED POPULATION OF THE SOUTHERN CALIFORNIA METROPOLITAN REGION

County	1980	1990	2000
Nondesert portions of:			
Inyo	15,150	19,000	22,200
Kern	327,700	381,600	416,000
Los Angeles	7,053,000	7,487,400	7,847,500
Riverside	485,400	614,900	691,800
San Bernardino	647,885	792,670	925,680
San Diego	1,802,700	2,260,600	2,637,800
Entire county:			
Orange	1,938,800	2,399,600	2,758,100
Ventura	503,400	658,400	807,300
Total	12,774,040	14,614,170	16,106,380

	Percentage Change 1980-1990	Percentage Change 1990-2000
Total	14.4%	10.2%

Source: SRI International

III ECONOMIC TRENDS TO 2000 IN THE CDCA

The future economy of the California Desert is linked to the future of both Southern California and the United States. Demand for the products and services of the key industries of the desert is derived from both national and regional (Southern California) sources. The agricultural sector depends heavily on national--and even international--market conditions in the determination of its prices and, therefore, of its income. Similarly, the minerals sector is dominated by national and international conditions for most commodities. However, for sand and gravel, output is contingent on construction activity in Southern California. In the recreation and tourism sector, much demand depends on national factors, including visits to Death Valley and other national monuments, as well as to the resorts of the Coachella Valley. Residents of Southern California use the California Desert for weekend pursuits--camping, offroad vehicle excursions, and backpacking.

The linkage of the U.S. economy with California's economy is not entirely one way. California has 10% of the U.S. population and personal income, and thus state economic conditions affect the national economy. For meaningful projections, conditions in both the U.S. and California economies must be considered.

On the other hand, most of the economic activity in the CDCA stems from outside the region, and the desert economy has little impact on the economics of other regions. Therefore, projections of economic change in the United States and Southern California can be used to imply changes in the CDCA. The National Planning Association (NPA) is a source of consistent projections for the United States and California (NPA, 1977).

Personal Income

NPA projections show personal income in the United States growing at 3.6% per year from 1975 through 1990* and personal income in California growing at 3.3% per year. Personal income in the Southern California metropolitan counties is projected to grow at an average rate of 3.5%; however, rates in the various counties range from 2.5% in Los Angeles County to 6.0% in Kern County. Table 10 summarizes projections for the United States, California, and Southern California metropolitan region. Also included are southern Nevada and western Arizona, which are projected to grow at 4.4% and 5.0% per year, respectively.

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*The Economics Department of McGraw Hill has projected a real growth rate of 3.7% for the United States in a recent study of long-term growth projects (McGraw-Hill Publications Company, 1978).

Table 10

PROJECTIONS OF PERSONAL INCOME FOR COMPARATIVE REGIONS--1975 TO 2000
(Millions of 1975 Dollars)

Area	1975	1980	1990	2000
Kern County	$ 2,000	$ 2,500	$ 3,500	$ 4,900
Los Angeles County	47,200	55,500	68,100	83,500
Orange County	12,000	15,900	21,100	28,100
Riverside County	2,900	3,800	5,400	7,600
San Bernardino County	3,700	4,900	6,900	9,700
San Diego County	9,500	13,400	20,900	32,700
Ventura County	2,500	3,300	4,900	7,200
Total Southern California Metropolitan Area	$ 77,800	$ 99,300	$ 130,800	$ 173,700
California	139,400	174,900	227,200	295,200
Clark County, Nevada	2,200	2,700	4,200	6,500
Mohave County, Arizona	170	200	350	600
Yuma County, Arizona	360	430	750	1,290
United States	1,257,500	1,555,100	2,135,900	2,933,700

Sources: 1975 data--Bureau of Economic Analysis, April 1977
Projections--SRI using growth rates in National Planning Association, 1977

Personal income in the CDCA was projected by assuming that income per capita is uniform among desert and nondesert portions of each county in the CDCA; then, the county projections of personal income were apportioned to the desert segment on the basis of the population projections made in Chapter II. The results are shown in Table 11. Total personal income in the CDCA is projected to grow from $3.4 billion in 1980 to $7.5 billion (1975 dollars) in 2000. The average annual growth rate for the CDCA is 4.0%--markedly higher than the projected growth rate for personal income in California.

Table 11

PROJECTIONS OF PERSONAL INCOME
IN CDCA BY COUNTY
(Millions of 1975 Dollars)

	1980	1990	2000
Imperial County	$ 675	$ 930	$1,290
Desert portion of:			
Inyo	19	23	30
Kern	335	440	620
Los Angeles	690	1,285	2,050
Riverside	860	1,240	2,080
San Bernardino	830	1,070	1,420
San Diego	10	20	35
Total CDCA	$3,419	$5,008	$7,525

Source: SRI International

The percentage of personal income coming from labor and proprietor's wages and salaries is expected to diminish over the next 25 years. Conversely, the percentage coming from property and transfer payments is expected to grow. For California as a whole, NPA shows 29.2% of personal income coming from property and transfer payments in 1975; by 1990, the percentage is projected to increase to 33.8%. This trend is in part, a consequence of an aging population, and is expected to occur in both the desert and nondesert portions of Southern California.

Earnings by Sector

Although the percentage of personal income coming from wages and salaries is projected to diminish, changes in the sectoral origin of wages and salaries are also occurring. In general, trade and government sectors are expected to gain at the expense of the farm and manufacturing sectors. NPA projections for the United States, California, and metropolitan counties in Southern California and Nevada are shown in Table 12. Although no projections are available for the nonmetropolitan counties of Southern California, these counties are expected to exhibit similar trends.

Employment Projections

Projections of employment in the CDCA were derived from changes in the ratio of employment to population found in the NPA. That is, the percentage change in each county's employment-to-population ratio for 1975 to 1990 was applied to the employment-to-population ratio in the desert portion of the county. The NPA projection series extend only to 1990; therefore, it was assumed that the rate of change between 1980 and 1990 also applied to the 1990 to 2000 decade.

The resulting projections are shown in Table 13. Employment in the CDCA is projected to rise from 162,000 in 1976 to 322,000 in 2000. This is a 98% increase, compared to the 63% increase projected for population over the same period. Employment is expected to rise faster than population because the proportion of people of working age will be greater and because the percentage of women working will continue to increase.

Table 12

PROJECTED CHANGE IN DISTRIBUTION OF EARNINGS BY SECTOR FOR METROPOLITAN REGIONS
IN SOUTHERN CALIFORNIA AND NEVADA, CALIFORNIA, AND THE UNITED STATES
1975-1990

	California Counties												State of California		Clark County, Nevada		United States	
	Kern		Los Angeles		Orange		Riverside and San Bernardino		San Diego		Ventura							
	1975	1990	1975	1990	1975	1990	1975	1990	1975	1990	1975	1990	1975	1990	1975	1990	1975	1990
Total earnings	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Farm	20.1	15.4	0.2	0.1	0.3	0.2	4.6	2.1	1.6	0.9	7.7	4.2	3.7	2.6	0.1	--	3.5	2.6
Manufacturing	6.6	5.7	26.5	19.9	29.6	22.8	16.6	14.8	14.2	11.8	13.1	10.2	21.1	16.7	3.9	2.8	25.6	19.6
Mining	8.5	6.1	0.6	0.5	0.7	0.8	1.1	1.0	0.2	0.1	2.5	1.2	0.6	0.5	0.1	0.1	1.4	1.0
Construction	3.2	1.6	4.0	3.3	6.4	8.3	5.2	5.7	5.9	6.4	4.9	7.0	4.8	4.5	7.9	10.4	5.6	5.9
Transportation, communication, utilities	5.9	6.4	7.3	8.0	3.7	6.9	6.7	7.8	5.2	6.9	4.4	5.0	7.1	8.2	7.2	8.2	7.2	7.4
Trade	13.5	15.4	18.3	21.9	17.3	18.2	15.9	14.6	13.9	14.4	15.6	13.0	17.0	18.8	14.2	16.4	16.8	18.7
Finance, insurance, real estate	3.1	3.3	6.6	7.4	6.1	5.7	3.5	4.4	5.0	5.3	3.4	3.5	5.6	6.0	4.1	3.7	5.3	6.2
Services	9.8	10.4	21.1	19.1	18.8	15.2	17.7	17.2	16.7	15.9	14.4	14.0	18.5	16.6	44.9	32.0	16.0	15.8
Other	1.3	0.7	0.2	0.1	0.5	0.5	0.8	0.4	0.7	0.4	1.1	0.9	0.5	0.4	0	0	0.4	0.2
Government	28.0	35.0	15.2	19.7	16.6	21.4	27.9	32.0	36.6	37.9	32.9	41.0	21.1	25.7	17.6	26.4	18.2	22.6

Source: NPA, 1977

Table 13

CDCA EMPLOYMENT PROJECTIONS BY COUNTY

	1976	1980	1990	2000
Imperial	28,324	35,290	44,900	53,790
Desert portion of:				
Inyo	1,160	1,110	1,270	1,500
Kern	18,153	20,320	23,050	25,980
Los Angeles	29,700	32,500	52,420	72,070
Riverside	47,837	59,950	83,860	107,570
San Bernardino	36,560	42,410	50,530	59,350
San Diego	533	680	1,010	1,500
Total CDCA	162,267	192,260	257,040	321,760

Source: SRI International

IV CALIFORNIA AGRICULTURE AND TRENDS IN THE DESERT

Introduction

Agriculture in the CDCA plays an important role in U.S. food production because of the year-round growing season. The Imperial Valley competes with Florida and Mexico as a source of fresh produce in the winter. The California Desert is also the only domestic source of some crops such as dates.

The California Desert accounts for only a small part of total U.S. agricultural revenues. In 1976 the $770 million it produced was less than 2% of total U.S. agricultural revenues, and roughly 8% of those in California. Major crops from the CDCA constitute between 6% to 14% of the total California agriculture; the CDCA contributed 14% of field crop revenues, 9% of vegetable crops, and 6% of fruit and nut crops. California produces more than 40% of the nation's fresh vegetables and fruits and 25% of its total food supply (California Commission for Economic Development, 1974).

Table 14 lists major crop acreage in the California Desert and shows California's share of U.S. production of these crops. Some interesting facts emerge from these comparisons: For instance, California produces 9% of alfalfa hay on only 4% of the U.S. acreage. More important is the dominance of California in the production of cantaloupes, carrots, lettuce, tomatoes, lemons, and dates.

Agriculture plays an important role in the state's economy by attracting processing industries and supporting supply industries. By using relationships identified in the California input-output table for 1967 (California Water Resources Department, 1973), the flow of goods from agricultural sectors can be traced to processing industries, exports from California, and to final demand. For instance, more than 50% of food and feed grains are sold directly to the dairy, poultry, and cattle sectors or to feed preparers and grain mills. More than 50% of California vegetables are sold directly to final demand in California and exported from California; with food processors (both canners and freezers) purchasing roughly 45% of the remaining vegetables produced.

The relative contribution of agricultural products from the California Desert to the processing industries can be assessed by observing the desert's contribution to total output in California. In 1976, desert production of vegetable crops was 9% of the value of California vegetable production, and desert production of fruit and nut crops accounted for 6% of California production. Based on these proportions, it appears that the desert contributes less than 10% of the vegetable and fruit processing

Table 14

CDCA SHARE OF U.S. ACREAGE FOR PRINCIPAL CROPS
GROWN IN THE DESERT

Major Crops	1976 Acreage (thousands) CDCA	Calif.	U.S.	CDCA Share of U.S. Acreage	California Share of U.S. Production
Field					
Alfalfa	255.8	1,100.0	26,556	1.0%	9.1
Barley	8.0	1,010.0	8,417	0.1	15.0
Cotton	97.6	1,120.1	10,914	0.9	23.5
Sugar beets	60.9	312.0	1,480	4.1	30.2
Wheat	194.3	940.0	70,824	0.3	2.8
Vegetable					
Cantaloupe	11.6	39.0	73	15.9	65.7
Carrots	12.1	33.0	76	16.5	50.3
Lettuce	54.3	155.1	223	24.3	73.0
Onions	9.3	25.4	108	8.6	24.2
Tomatoes	4.6	263.2	438	1.1	71.7
Watermelon	3.5	9.8	235	1.5	7.5
Fruit and nut crops					
Grapefruit	9.5	16.9	178	5.3	10.3
Lemons	6.4	47.9	68	9.4	86.4
Oranges	2.5	192.5	846	0.3	21.6
Tangerines	2.6	10.6	75	3.5	25.0
Grapes	7.2	576.0	n.a.	n.a.	88.6
Dates	3.8	4.1	n.a.	n.a.	99.4

Sources: County Agricultural Reports, County Agricultural Commissioners Offices. SRI International, Agricultural Statistics 1977, and California Statistical Abstract 1977

n.a. = not available.

jobs in the state; however, the actual contribution depends on the mix of vegetables and fruits produced in the desert compared with the total state.

For field crops, the contribution of desert output to processing industries in the state is small. First, most alfalfa requires no additional processing; second, cotton is ginned but no textile industry exists in California. Thus, these two crops, which comprise 50% of the field crop acreage, support little additional industry outside the agricultural sector.

In conclusion, agricultural production in the California Desert is important because of the long growing season afforded there, and for its unique crops and winter harvests, rather than for the magnitude of CDCA production.

Future Trends in Agriculture Production in the Desert

The acreage harvested in the California Desert has been growing steadily since 1940. It was 870,000 acres in 1976, an increase of 14% over the 1970 acreage of 761,000. Approximately 82% of the acreage has been devoted to field crops during the last 20 years.

Future increases in acreage are unlikely because of shortages of suitable land and water. The crops to be planted in the desert are subject to the same economic and resource factors as the rest of California. Therefore, a set of projections (King et al., 1977) made for California will be discussed to identify possible changes in desert production.

Alfalfa. Demand for alfalfa and other hay depends on feed requirements for livestock. Whether alfalfa production increases in the desert is largely contingent on the future of feedlots in the CDCA. Imperial Valley alfalfa is competitive in markets in the San Joaquin Valley and Arizona.

Barley and Wheat. The major feed grain in California has traditionally been barley; however, wheat production has been growing rapidly since the introduction of new varieties, with new irrigated varieties popular in the CDCA. Wheat acreage in the CDCA grew from 80,000 in 1970 to 194,300 in 1976, whereas barley acreage fell from 99,000 acres to 8,000 acres. California produces a small portion of the U.S. wheat output and therefore has little effect on national prices. However, the trend to wheat production will slow as the competition with other U.S. wheat producing areas increases.

The projections in Table 15 indicate that California wheat acreage has decreased. Desert production may parallel that trend.

Table 15

PROJECTIONS OF CALIFORNIA ACREAGE OF MAJOR CROPS PRODUCED IN THE CDCA

	Units	Acreage Harvested 1975	Acreage Harvested 1985	Yield per Acre 1975	Yield per Acre 1985
Field crops					
Alfalfa	tons	1,120,000	1,226,000	5.9	6.2
Barley	bu	1,060,000	1,024,000	57.0	63.0
Cotton	bales	875,000	1,044,000	2.2	2.3
Sugar beets	tons	326,000	338,000	26.0	28.0
Wheat	bu	1,001,000	934,000	62.0	70.0
Vegetable crops					
Cantaloupe	cwt	39,600	55,518	155	180
Carrots	cwt	32,900	28,350	317	370
Lettuce	cwt	155,900	132,652	245	290
Onions	cwt	31,600	37,054	345	375
Tomatoes	cwt	326,000	275,323	466	564
Watermelon	cwt	9,200	12,414	183	210
Fruit and nut crops*					
Grapefruit	tons	16,386	15,000	12.1	16.0
Lemons	tons	47,400	40,000	13.2	16.0
Oranges	tons	197,700	190,000	9.5	10.5
Grapes	tons	535,900	562,740	7.3	8.0
Dates	tons	4,138	4,330	5.8	6.0

*Bearing acreage shown for fruit and nut crops.

Source: Gordon A. King, H. O. Carter, and D. J. Dudek, "Projections of California Crop and Livestock to 1985," University of California Cooperative Extension, May 1977

Cotton. Table 15 projects a considerable increase (19%) in 1985 acreage compared to 1975. However, cotton acreage has fluctuated considerably from year to year in California. Cotton acres harvested totaled 1,238,000 in 1975 and 1,120,000 in 1976. Acreage in the CDCA parallels these fluctuations. California's share of U.S. production had been increasing under legislation passed in 1973 that expired in 1977; thus, the outlook for cotton in California depends on future farm legislation.

A major factor in the demand for cotton is the competition it faces from man-made fibers. Cotton is at a price disadvantage; however, the initial swing to man-made fibers has abated and cotton fabrics and cotton blends are in higher demand again.

Sugar beets. Sugar beet production in California is projected to grow slightly. Sugar production in the United States depends on protective import policies because foreign sugar is available at lower prices. Sugar beet production in the CDCA is unlikely to rise and may decrease if sugar prices fall in response to foreign price competition.

Agriculture in the CDCA and World Production

Agricultural areas in the CDCA produce only three crops in which there is significant world trade--wheat, sugar, and cotton. The United States is a leading cotton exporter, with major sales to Red China in recent years. California also plays a major role in U.S. trade because it produces more than 23% of U.S. cotton (see Table 14); however, the Imperial Valley contributes only a small portion--6% of California output.

Sugar prices in the world market are lower than U.S. prices; therefore, the outlook for sugar beets is not good. It is thus unlikely that the United States will soon become a competitor in world sugar markets; foreign countries can produce cane sugar at much lower prices than the United States can produce sugar beets.

Although the United States is a major exporter of wheat, CDCA production is minor and unlikely to change soon. Nevertheless, the value of Imperial Valley production cannot be dismissed. However, the export situation may soon change. According to projections of the Food and Agricultural Organization of the United Nations, the developed nations could produce a surplus of wheat amounting to 159 million metric tons by 1985. The deficit in developing countries is estimated to be only 36 million metric tons. Thus, there is a potential surplus of 123 million metric tons worldwide (FAO, 1975) that could lower wheat prices, possibly causing farmers in the CDCA to reduce acreage devoted to wheat.

Thus, in terms of total output the agricultural production of the CDCA is not a major factor in world markets; the CDCA still has an important role in determining U.S. supplies and the prices of international commodities. Small changes in supply can often cause wild swings in

commodity prices. CDCA production is important because it contributes to national supply, and the low cost of water in the CDCA will keep the Imperial Valley competitive in national and world markets.

Outlook for Inputs to Agricultural Production

Land

The first requirement for agricultural production is land. Most arable land in the CDCA is under cultivation [Southwest Border States Regional Action Commission (SBSRAC), 1977] with arable land limited by the availability of water. In recent years, increases in agricultural production (especially in Imperial County) have been due to double-cropping. In 1976, it is estimated that 155,000 acres were double-cropped in Imperial County--an increase of 25% over 1974. Further increases in double-cropping could lead to continued expansion of production and employment.

Development of geothermal energy resources poses a threat to arable land in Imperial County. Although the actual land required for drilling activity and generating plants is small, nonetheless, extensive geothermal development could cause irrigated land to subside. Regrading for continued irrigated production could impose a cost exceeding $200 per acre (SBSRAC, 1977).

Water

Water for irrigation in the Imperial Valley comes from the Colorado River through the All-American Canal. Between 1965 and 1975, water use in the Imperial Valley increased 20% (SBSRAC, 1977). The price of water is the lowest in California--$4.25 per acre foot versus $20 to $40 in the Central Valley of northern California. Continued supplies from the Colorado River will depend on the existing complex of laws and treaties allocating the flow of the Colorado among riparian states and Mexico. Heretofore, flow has been sufficient so that fixed allocations for all claimants have not been necessary. Completion of Arizona's Central Valley Project and continued metropolitan growth in Southern California may result in less water for CDCA agriculture. Although Imperial County has priority over San Diego and Los Angeles, it ranks third behind Yuma, Arizona, and the Palo Verde Irrigation District in Riverside County.

Another problem related to water supply is soil salinity. In the past, excess salts have been leached out by overwatering, which in turn results in excess runoff. This runoff in combination with heavy rains causes the water level in the Salton Sea to rise. Because of damage to shoreline properties, a lawsuit has been filed against the Imperial Irrigation District. Any future restrictions on water use resulting from litigation or legislation will require changing the mix of crops planted in the Imperial Valley.

Agricultural Chemicals

Two forces restrict the use of agricultural fertilizers, insecticides, and herbicides: the first is the rising cost of energy, the second is protection of the environment.

Fertilizer prices have risen with shortages in natural gas--the main source of nitrogen-based fertilizers. Because most insecticides and herbicides are derivatives of petroleum products, the increase in oil prices has also resulted in higher insecticide and herbicide prices.

On the environmental side, a movement to integrated pest management has occurred and attempts to incorporate natural factors in the control of pests. Thus, the trend is away from spraying at regular intervals to spraying as needed and to employing other agronomic practices such as crop rotations to avoid build-up of pest populations.

A second aspect of the environmental issue is occupational health. Stricter control of toxic materials and worker contact with them will reduce use of particularly toxic chemicals that have proven effective in the past.

Thus, the use of agricultural chemicals is unlikely to continue to grow in future years at the rates of the past decades. Although prices will probably continue to rise, it is unlikely that supply will be severely restricted over the long term. Increased energy costs are likely to result in increased acreage and production of field crops and decreased acreage and production of vegetables (Adams et al., 1977).

Labor

The most productive areas of the CDCA are near a large labor pool of farm workers in Mexico. It is estimated that between 15,000 and 25,000 residents of Mexicali hold "green cards" issued by the U.S. Immigration and Naturalization Service for farm labor. At peak harvest times, approximately 85% of seasonal workers in Imperial County are Mexican nationals (SBSRAC, 1977). This large pool of labor has contributed much to the success of agriculture in Imperial County.

Although unionization of farm workers is possible, the workers have already reaped the benefits of higher wages because of union pressures. In October 1977, California farm wages averaged $3.67 per hour compared with $2.00 per hour in 1972 (*Business Week*, 1978).

Mechanization represents another constraint to growing unionization. Vegetable crops have traditionally required much hand labor for cultivation and harvesting; recent wage increases, however, have spurred farmers to substitute mechanical harvesters for land labor. Consequently, mechanical pickers for lettuce and fresh tomatoes are becoming more prevalent.

The labor supply in the Imperial Valley does not appear to be a long-term problem. There is an ample labor force across the Mexican border; recent wage gains have attracted workers; and any reduction in labor supply may be offset by continued mechanization.

Livestock Trends

In 1976, sales of cattle and calves in California amounted to more than $1 billion, ranking first in value among all agricultural commodities produced in California. Imperial County accounted for approximately 10% of the total or $107 million. Most of the Imperial County production comes from feedlots that must compete in national markets for grain and feeder stock. In 1977, the cattle industry went through a severe contraction, with low prices causing the liquidation of herds nationwide. In California and much of the West, the situation was aggravated by range conditions made poor by a two-year drought. A severe contraction of cattle supplies, combined with rising costs, caused six feedlots in Imperial County to go out of business.

The long-term viability of feedlot operations in the United States depends on inexpensive grain supplies. Because net shipments into California constitute roughly 90% of feedlot sales, feedlots in the state also depend on supplies of stocker and feeder cattle from other states, with competition from feedlot operations in Texas and the Midwest. It appears that supplies of feed grains in the United States may remain abundant if the wheat surplus discussed above comes to pass.

King et al. assert that by 1985, 58% of the California beef market will be supplied by meat shipments into California compared to 47% from 1968 to 1972. The remainder of the 1985 supply of beef in California will be met by (1) an increase in number of cattle in feedlots from 2 million from 1968-1972 to 2.3 million head in 1985, and (2) an increase in production from cow-calf operations from a 1968-1972 average of 905,000 head per year to 1,000,000 in 1985.

Livestock trends in the CDCA are likely to parallel those in the remainder of California. Feedlots in Imperial County can supply Los Angeles with beef overnight by truck. Thus, if the market for beef grows, Imperial County's location places it at an advantage over out-of-state competition.

The outlook for cow-calf operations in the CDCA is less sanguine. Grazing lands are poor to start with, and environmental considerations and land withdrawals are likely to restrict the amount of public lands available for lease.

After 1985, the outlook for California livestock production becomes highly uncertain. Continued growth in output will require genetic and management improvements to increase weight gains per unit of available feeds. Likewise, continued improvement in yields of feed grains will be necessary.

Many uncertainties also exist about the demand for beef. Over past decades per capita consumption has increased with increases in personal income. Obviously, however, a saturation limit will occur when consumers no longer increase their use of beef. Above this point, growth in demand will depend more closely on population growth. Other factors such as changing tastes and competitive products also affect demand.

Even if the many factors that affect demand are ignored and if it is assumed that current trends will continue, the production of livestock in the CDCA is unlikely to grow significantly over the long term. The CDCA is not a source of feeder cattle or feed grains; rather, it depends on imports. The comparative advantages of the CDCA, then, are related to its closeness to markets. However, this market is being overcome by the increasing use of boxed beef. It is cheaper to ship meat to California than live cattle and their feed.

The Outlook for New Crops in the Desert Area

Although research into new desert crops is varied, most short-term interest focuses on two crops that have been grown commercially elsewhere.

Jojoba (*Simmondsia chinensis*) produces a seed that is 60% light, liquid wax almost identical to industrially important oil of the sperm whale. The United States has forbidden importation of sperm whale oil since 1970 and international sanctions have been imposed on killing sperm whales. Thus, with decreasing stockpiles, this important oil will become increasingly scarce. Conversely, the market for the jojoba substitute is expected to grow sharply (Weisbecker et al., 1978).

Jojoba is particularly suited to the desert area. It needs little or no irrigation, and it tolerates saline and alkaline soils and saline irrigation water. The federal government is encouraging it as a crop to improve the economic self-sufficiency of several Indian reservations in California and Arizona. Commercial organizations, among them the Tenneco Corporation, are also reported to be interested.

Guayule (*Parthenium argentatum*) was used as a source of rubber in the early part of this century and during World War II. Given international economic and political factors, the United States is considering turning to domestic sources for natural rubber. Currently, U.S. research is under way, and a pilot commercial plant in Mexico is using guayule. Collaboration between the two countries is considered likely, but widespread commercial growing of guayule in this country (and the CDCA) is unlikely before the late 1980s (Weisbecker et al., 1978).

Researchers have suggested other new crops to help alleviate the energy crisis, to reduce reliance on imports of certain raw materials, to provide food, and to produce feedstocks for animals. Most of these are unlikely to become large-scale commercial ventures in the CDCA within the next 20 years.

V OUTLOOK FOR MINERALS IN THE CDCA

This chapter examines minerals known to exist in the CDCA and that are either currently produced there or might be in the future. For each mineral in Table 16 future supply and demand considerations, potential technological advances, and the part the CDCA is likely to play in supplying these minerals is examined. Appendix B contains tables on the major domestic and international suppliers, U.S. and world reserves and resources, 1977 production levels, and U.S. and world demand, 1974-2000.

Projecting future consumption of specific minerals is difficult. Not only are data about minerals in the desert scarce, but great uncertainties are inherent in the minerals industry itself.

Whether any mineral is developed, including deposits in the CDCA, depends on the price that the mineral can bring. In addition, for producers, prices fluctuate widely from year to year, determined by unpredictable supply and demand factors in the world market (e.g., the discovery of a better substitute, or the depletion of a mineral deposit). A most important factor affecting supply is the recent rise in production costs resulting from higher operating costs and greatly increased capital costs for new mines.

Politics also play an important role in influencing mineral availability. China recently opened up trade with the United States; this could conceivably make a huge supply of minerals available to the West once China has the technology to produce its reserves of copper, tin, aluminum, and other metals (Wall Street Journal, 1978). Wars and civil insurrections can disrupt the supply of minerals, as is currently the case in Zaire, where copper mines and their equipment are being damaged or destroyed by rebel forces. Cartels are also effective ways of boosting prices. Most experts agree, however, that conditions facilitating cartels do not exist among most nonfuel mineral producers. There are too many significant producers and the elasticity of demand is often too great because of the possibilities for recycling, substituting, and stockpiling, for cartels to form as they did in the case of oil (Council on Environmental Quality, 1977). The one exception is bauxite, for which a few countries control most of the reserves.

Legislation by the U.S. Congress will also affect mineral development. Many controversial laws related to mining have been enacted in the past 2 years. Much of this legislation has been mounted in response to interest groups that claim the Mining Law of 1872, which regulates hard rock mining in the public domain, is too lenient to miners and fails to protect the land from abuse.

Table 16

SUMMARY OF MINERAL TRENDS IN THE CDCA

	Increase in Importance	Stable	Decline in Importance	Not in Production in CDCA As of 1974
Antimony				x
Asbestos				x
Barite	x			
Boron	x			
Calcium chloride		x		
Cement		x		
Clay		x		
Copper			x	
Diatomite				x
Feldspar		x		
Fluorspar				x
Gold	x			
Gypsum		x		
Iron ore		x		
Lead		x		
Lime		x		
Lithium	x			
Magnesium		x		
Manganese				x
Molybdenum		x		
Perlite		x		
Pumice		x		
Rare-earth minerals	x			
Salt		x		
Sand and gravel		x		
Silver	x			
Sodium carbonate	x			
Sodium sulfate		x		
Stone		x		
Talc			x	
Tungsten	x			
Uranium				x
Vanadium				x
Zeolites	x			
Zinc		x		

Source: SRI International

As a result, Congress passed the Surface Resources Act of 1955 and the Federal Land Policy and Management Act of 1976, and is considering other acts as well. The laws that have been enacted give enforcement powers to the responsible agency and require that miners acquire additional permits. The mining industry resents the additional bureaucratic steps these laws create and fears that future laws will be even more stringent. In particular, the industry fears that current attempts to repeal the Mining Law of 1872 will be successful, and that mining companies will not be able to survive the "ballooning number of laws, of agencies, of governmental employees and expenses, of regulations, and of restrictions ..." (Mining Congress Journal, 1978).

The new legislation does appear to conflict with state and local statutes, as well as containing ambiguities that might have to be settled in the courts. These problems, in addition to the reforms urged for the mining industry, are likely to inhibit development of ore deposits in California. Small-scale miners, in particular, may be unable to afford the costs of the increasingly complex permit process and thus be forced out of the mining business. How much of an impediment to development the new procedures will be, however, remains to be seen.

As the preceding discussion indicates, mineral development in the CDCA will depend on prices in the world market, new legislation and interpretation of the old, and on the outcome of jurisdictional disputes between the state and federal government. Development will also depend, of course, on the size and quality of the deposits found.

CDCA production of boron, rare-earth minerals, sodium carbonate and sodium sulfate will continue to be important in national and international markets. Evaluation of worldwide production and known reserves of other minerals found in the CDCA indicates that deposits in the CDCA are unlikely to become major factors in world markets. Under favorable circumstances it may become economic to develop selected deposits. However, in most cases richer deposits are found elsewhere in the world. The comparisons of current U.S. and world reserves in Appendix B show that resources of most minerals found in the CDCA are extensive. Thus, future production could come from a number of sources. The attractiveness of deposits in the CDCA could improve under changing world political alliances and changing economics. In any event, mineral companies will continue to be interested in exploration in the CDCA.

Much of the information contained in the following mineral discussions come from Mineral Facts and Problems (Bureau of Mines, 1975), unless otherwise noted. Other Bureau of Mines publications used are in the list of references. Some information on California minerals by county is contained in the 1974 Minerals Yearbook, Volume II (1977), but, in general, data on specific minerals in the CDCA are limited. Many private companies and even government sources withhold their data from the public for reasons of confidentiality.

Selecting a base year for calculating long-term growth rates must be done with caution because annual demand may fluctuate considerably

above and below the long-term trend line. The growth rates in Minerals Facts and Problems cover the 1973 to 2000 period. For many nonfuel minerals demand was above the long-term growth trend in 1973 and 1974; consequently, growth rates based on the demand in these years may be above the long-term trends. Another factor adding uncertainty to the Bureau of Mines' projections is the future long-term growth rate of the world's economy. Recent inflationary trends and the maturation of economies of developed nations are anticipated to result in slower growth in the future. If this should come to pass, projections based on past growth rates may prove overly optimistic. However, even reduced rates of growth can result in large, absolute increases in demand from year-to-year.

As the foregoing discussion indicates, considerable uncertainty exists in regard to future ore bodies that might be found in the California Desert and in regard to the future worldwide production of many commodities. Any policies for land use in the CDCA must weigh these uncertainties carefully and allow for flexibility and revision should the national interest favor developing mineral resources over the alternative uses for an area.

Antimony

Only about 5% of the U.S. primary demand for antimony is produced domestically; the remainder is imported from Bolivia, Mexico, and the Republic of South Africa. Idaho is the single most important domestic producer, although small scattered deposits are found in California and other states.

Domestic reserves are considered adequate to continue producing 5% of U.S. primary demand to the year 2000. Together, U.S. and world reserves should be able to handle increasing demands for antimony in the next 25 years. U.S. demand is expected to increase at a rate of 2.9% annually and world demand at a rate of 2.3% per year.

Recycled scrap will continue to be an important source of antimony in all parts of the world, and the demand for scrap, or secondary demand, is expected to increase at levels only slightly lower than primary demand.

Future technological developments are likely to diminish the demand for antimony. Antimony is currently used to harden and strengthen the lead used in storage batteries, to flameproof material, and to cover cables. The development of better lead alloys, other flameproofing compounds, and new plastics for cables would all act to reduce the demand for antimony. The key factor in future demand for antimony is battery technology--breakthroughs on any of several fronts would reduce demand for lead and, therefore, antimony. Deposits of antimony in the CDCA are small and are not considered to be economic to develop at this time.

Asbestos

The USSR has recently replaced Canada as the world's largest producer of asbestos. Nevertheless, the United States still relies on Canada for about 90% of its asbestos imports. California is a leading supplier of asbestos, although some plants were forced to close in 1974 because of heavy rains and for other reasons. No production is currently taking place in the CDCA, but it is conceivable that deposits of asbestos could be found there in the future.

Demand is expected to increase at a slow 1.2% average rate annually, compared to a faster 3.2% rate worldwide. Another source predicts declines of about 1% annually through 1985, probably due to the bans on the use of asbestos in several products. Reserves are not considered to be sufficient to last until 2000 unless new finds are discovered, although they will be adequate in the United States if demand continues to decline.

Many new uses are being considered for asbestos, including its use in asphalt paving materials. Furthermore, there are few good substitutes for asbestos. Unfortunately, asbestos does pose a health hazard in the mining, processing, and utilization stages, and its future will be limited unless this hazard can be reduced.

Synthetic asbestos is a real possibility for the future, and could greatly alleviate supply problems. It is possible that higher prices due to reduced supplies will encourage exploration for asbestos in the California Desert in the future.

Barite

The United States is the world's largest producer and consumer of barite and is a large importer as well. Over 76% of production comes from Nevada in 1977. California is a minor supplier of barite, mostly from mines in Shasta County. A small amount is produced in Kern County in the Rosamond plant.

Barite is chiefly used in oil- and gas-well drilling muds. It is expected that because of its association with oil production, the demand for barite will increase substantially between now and 2000. U.S. and world reserves are considered to be sufficient for meeting future demand.

If low-grade deposits of silver are mined in the California Desert, as is likely to be the case before 2000 (see "Silver," p. V-16), large amounts of barite will be produced as a by-product. The Langtry and Waterloo deposits are known to contain substantial amounts of both silver and barite, and so it appears very likely that the CDCA will become a more important source of barite in the future.

Boron

Virtually all of the U.S. boron production and about 60% of that produced throughout the world comes from Inyo, San Bernadino, and Kern counties in California. World demand for boron has been increasing sharply because of the increased demand for glass wool containing borite for insulation.

Demand is expected to increase at a relatively rapid rate of 4.1%-4.2% annually between 1973 and 2000 in the United States and throughout the world. World reserves are more than adequate to cover projected world demand. Turkey is expected to increase its share of world production and provide more competition with the United States for the European export market.

Boron production in the California Desert will continue to be an important source of supply in the world market, and will probably increase in significance as more countries consume increasing quantities of boron.

Calcium Chloride

Two firms produce calcium chloride from wells at Bristol Lake in San Bernardino County (Minerals Yearbook). Although no supply and demand information was found on the markets for calcium chloride, it seems likely that its production will continue to be limited.

Cement

The United States ranks second only to the USSR in the production of cement, and California is the country's foremost supplier. In Southern California, all of the cement is produced in San Bernardino, Kern, and Riverside counties. Six out of eight of the cement plants in Southern California are located in or very close to the boundary of the CDCA.* U.S. demand has fluctuated widely over the past 10 years, probably reflecting the direct relationship between the cement and construction industries. The United States typically imports less than 1% of its annual cement requirements.

Worldwide demands are expected to increase about 3% annually between 1973 and 2000. Resources are plentiful throughout the world but are not always located near market areas. Because of the low value-to-weight ratio of cement, the supply of cement has traditionally depended on the cost of transportation. Recently, the highly energy-intensive cement manufacturing process has raised a new concern--the availability and cost of fuel. Shortages of manufactured cement could thus occur in areas where energy is scarce.

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*Personal communication, Doug MacIver, November 1978.

Rising fuel costs and the increasing scarcity of natural gas trouble California producers (Minerals Yearbook). Because cement companies are on interruptible contracts for gas and electricity, many have converted to coal as a source of fuel. Because some cement producers in the CDCA are buying coal supplies and even coal mines to ensure a long-term source of energy, it is anticipated that the CDCA will continue to be an important supplier of cement, possibly increasing its share of the market if an energy crisis occurs.

Clay

The United States is second to the USSR in its production of clays. Although California is not a major producer, small amounts of common clay, fine clay, bentonite, kaolin, fuller's earth, and ball clay are mined in the five CDCA counties.

Growth in U.S. demand is expected to be higher (4%) annually than world demand (2%) between 1973 and 2000 because the United States is expected to require more of the high value clays. Resources of common clay and shale are virtually unlimited throughout the world; reserves of the remaining clays vary considerably by country. The United States is considered to have one of the best supplies of the many varieties of clay. High grade clays could come in short supply in some parts of the world, which could increase the volume of U.S. clay exports; however, clay production in the CDCA is likely to retain its relatively small importance.

The potential use of high-alumina clays, like kaolin clays, to produce alumina or aluminum would greatly increase the demand for clay. Although the technology to manufacture aluminum from clay exists, it is more costly than using bauxite ore.

Copper

The United States produces by far the greatest amount of copper in the world. California contributes a small amount to this supply. U.S. demand for copper has increased steadily over the past 10 years and is expected to increase at a 3.4% annual rate between 1973 and 2000. Projected world demand is slightly higher at 3.9%, reflecting more demand for raw copper and less demand for recycled copper.

The United States has approximately 20% of the world's reserves and resources, with five states containing 90% of these known reserves. Reserves of copper are expected to run low about the year 2000. As this occurs, recovering old scrap, and exploring for new terrestrial and marine sources of copper will be emphasized.

The world market for copper is currently depressed, because of large reserves of mined copper and increasing production. Producers are attempting to sell more in an attempt to make up for lower prices--a move that reduces copper prices further. One expert predicts a stronger market

and higher prices in the near future, either because copper is purchased to be held aside by independent parties or because reserves become depleted (Minerals Yearbook). In the short run, production in the CDCA is likely to continue its decline, although production should stabilize and possibly even increase in the long run, if world shortages occur.

Diatomite

The United States is the world's largest producer and consumer of diatomite, exporting a considerable portion of its production as well. California, principally Santa Barbara County, is the main supplier of diatomite, or diatomaceous earth. The world's largest and purest deposit of diatomite is found in Lompoc, California. Diatomite is not currently produced in the CDCA, but at one time was produced in Inyo County.

World demand is expected to increase 6.2% annually to 2000, an increase that is slightly higher than the anticipated 5.4% annual increase in U.S. demand. One principal use of diatomite that is expected to increase is in filtering plant effluents before they are returned to nearby streams. Reserves and resources appear to be plentiful throughout the world and easily adequate to meet projected needs to 2000 and beyond.

California is expected to continue as the major supplier of diatomite unless problems such as zoning, taxation, fuel shortages, and costly antipollution requirements interfere. Deposits in the CDCA, however, are small and impure, and are unlikely ever to be economic to mine.*

Feldspar

The United States produces more than one-third of the world's annual supply of feldspar. California ranks fourth among major suppliers in the United States; together, the top four states--North Carolina, Connecticut, Georgia, and California--supply 98% of the U.S. total. San Bernardino is the only county in the CDCA that produces feldspar.

Demand for feldspar is expected to increase moderately between 1973 and 2000, at an annual rate of 3.6% in the United States and 4.4% elsewhere. Supplies of feldspar, which is one of the most abundant minerals in the earth's crust, are considered to be vast throughout the world.

Domestic production of feldspar is relatively price-inelastic; price changes have little effect on the quantity of feldspar produced. This inelasticity, coupled with no foreseeable major supply-demand charges, suggests that San Bernardino production will remain relatively stable.

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*Personal communication, Kent Cochran, GREFCO, Inc., August 1978.

Feldspar production in the CDCA is expected to retain its importance in the world market.

Fluorspar

Mexico is the world's largest producer of fluorspar, followed at a distance by the USSR, Spain, and Thailand. The United States imports about 80% of its fluorspar annually for use by its steel, chemical, and aluminum industries. Major producing states in the United States are Illinois, Montana, Texas, and Nevada. California is currently producing no fluorspar.

Future demand for fluorspar is expected to grow at an average annual rate of 3.8% in the United States and 4.4% worldwide. Demand in the United States has decreased in recent years because of restrictions on the use of fluorocarbons in aerosol sprays. Concern about the release of chlorofluorocarbons into the atmosphere has and will continue to reduce the amount of fluorspar used by iron, steel, and chemical manufacturers. In addition, the limited supplies of fluorspar between 1968 and 1973 led to the substitution of other chemicals and different processes that required less fluorspar.

U.S. reserves and resources appear to be large and widespread. The same is true throughout the world, with particularly large reserves in the Republic of South Africa. Worldwide reserves are adequate to handle most of the anticipated future demand, with the possible exception of a few of the scarcer varieties of fluorspar. Many new discoveries of fluorspar have been made, and worldwide production has increased considerably in recent years--a trend that will continue as long as prices escalate rapidly.

Small quantities of fluorspar have been produced in Inyo, Riverside, and San Bernardino counties in the past. Although known deposits in these areas are small, the potential for new discoveries is good.

Gold

The United States produces roughly one-quarter of its primary demand for gold; much of the balance is imported from the Republic of South Africa. Although California is not a leading gold producer, some gold is mined in Inyo and San Bernardino counties, among others.

Supply and demand relationships are complicated by the demand for gold for speculative and numismatic purposes. Taking these factors into consideration, demand is expected to increase by 3.4% annually in the United States and 2.6% annually worldwide. The demand for secondary gold is expected to increase at even higher rates throughout the world.

U.S. reserves, as in the past, will not be adequate to meet U.S. demand, and the United States will continue to rely on international reserves and resources, which will be adequate to handle worldwide demand through 2000.

In the long run, the increased gold prices of recent years will lead to higher U.S. output. For the time being, however, outputs are declining because lower-grade ores, which produce less gold, are mined under virtually fixed tonnage production quotas in the mines and mills. Larger U.S. domestic supplies will be needed, especially because of South Africa's intended plan to convert as much as 30% of its annual output into coins, which would reduce its contribution to world demand from 64% (in 1973) to as little as 33%.

Gold is currently produced from two lode mines in San Bernardino County, and a smaller amount is recovered from tungsten ore in an Inyo County mine. The Keystone Canyon Mining Co. recently reopened its mine in Inyo County, as have several other companies in view of rising gold prices. As rising demand and falling supplies continue to push up prices, more gold mines in California and elsewhere in the country are likely to find it profitable either to reopen, or to increase their output and mine lower grade deposits.

Gypsum

The United States is the leading producer and consumer of gypsum, accounting for about 18% of production and 28% of consumption. California is the leading supplier of both crude and calcined gypsum, and provides about 10% of the total U.S. demand for crude gypsum. U.S. Gypsum Co. produces the most crude and calcined gypsum from its mine and plant in Imperial County. Kern and San Bernardino counties also produce gypsum.

Demand to 2000 is expected to increase slowly at a 2% annual rate in the United States and the world. This will largely result from the competition gypsum faces from other building materials. Reserves of gypsum are quite large throughout the world, thus there is no anticipated shortage in the future.

Gypsum is important to the construction industry because there is no good substitute in Portland cement. It is also used in gypsum boards and other prefabricated products, although more substitutes are available here. Future demand for gypsum will fluctuate with cycles in construction. The CDCA is likely to continue as a major U.S. source of crude and calcinated gypsum.

Iron Ore

The United States ranks fourth in iron ore production worldwide, and in some years edges out Australia for third place. California places third in the list of iron ore producing states because of its mines in Riverside and San Bernardino counties.

Iron ore is an abundant mineral, with reserves well-distributed throughout the world. No shortages are anticipated during the next 200 years, if present consumption figures are applied. Demand is expected to rise slowly--only 1.5% annually in the United States and 2.8% annually in the world. This trend is explained by anticipated use of new, stronger steel, less of which will be required. In addition, demand for steel appears to be a direct function of population, and a declining rate of population growth, especially in the United States, indicates less of an increase in the demand for steel.

Iron ore mines in the CDCA will undoubtedly retain their important place in the U.S. economy but are not expected to gain in significance.

Lead

The United States has been the leading producer of lead for many years. California contributes little to this supply, with only a small amount of lead produced in San Bernadino County.

Like iron, resources of lead are scattered plentifully throughout the world. Although lead is an important mineral in the production of storage batteries, a lead-calcium-tin alloy has recently been developed that appears superior to the traditional lead-antimony alloy and requires less lead. Therefore, future demand for lead is likely to decline. Thus, the demand for lead is expected to increase by only 1.6% annually in the United States (an average of both primary and secondary demand). Worldwide demand is expected to be somewhat higher--2.6% annually--because of increased requirements from less-developed countries.

San Bernardino's share of lead production will probably continue to be small.

Lime

The United States runs a close second to the USSR in annual production of lime, and is virtually self-sufficient in this commodity. Ohio and Pennsylvania are the major domestic suppliers. California does, however, have 15 plants spread throughout the state. One of the largest is in San Bernardino County. Lime is also produced in Imperial County.

Lime is not found in a natural state, but limestone and other compounds containing lime are plentiful worldwide. Demand for lime is expected to increase moderately between 1973 and 2000, at an annual rate of 2.6% in the United States and worldwide. The United States is expected to continue to import a small proportion of its yearly consumption.

Because lime is an important ingredient in cement, the demand for lime will fluctuate with the demand for cement. The CDCA produces all of the lime used in Southern California and is expected to retain its share of the California market.

Lithium

More than one-half of the world's lithium is produced and consumed in the United States. California ranks third, after North Carolina and Nevada, in domestic production. All of California's production comes from Searles Lake in San Bernardino County. Because the lithium content of Searles Lake is decreasing, the state's annual production is declining rapidly, although revenues are increasing because of higher prices.

Future demand for lithium depends largely on technological advances. Scientists are currently interested in developing a lithium anode battery for automobiles and peak-energy storage use. Government-funded programs are investigating this possibility. Lithium is also used in nuclear fusion, and demand for it could increase if fusion becomes widely used as an energy source. Forecasters predict that the new battery may become a reality this century, whereas fusion will not become commercially used on a large scale until after 2000. Using these assumptions, forecasters expect lithium demand to increase by 5% annually in the United States over the next 25 years. A growth rate of 5.5% is anticipated throughout the world, beginning with larger demands from Japan and the USSR, and followed by higher demands from the less-developed countries.

Most of the world's lithium reserves are in the United States, the USSR, Canada, and Southern Rhodesia. Deposits are contained either in granite-like pegmatites, or in brines. In the United States, North Carolina sources are found in pegmatites, whereas brines found in desert valleys are the source of Nevada and California production. Geothermal brines will serve as a potential source of lithium in the future, but recovery is not currently technologically feasible.

There is some concern about whether or not reserves are adequate to handle future demands for lithium (Science, March 12, 1976). Clearly, adequate supplies will depend on the uses to which lithium is put in coming decades, and technological progress in lithium recovery. The United States has adequate reserves to meet annual 5% increases. However, the widespread use of lithium anode batteries could strain supplies, as could nuclear fusion as a source of energy. However, because lithium costs constitute only a small fraction of the total reactor cost, the market could support a much higher price for the mineral, and thus exploration for new sources of lithium and development of new methods of recovery would be profitable.

New reserves are likely to be found in the CDCA and known reserves that are currently uneconomic are likely to be mined in the future as prices rise.

Magnesium

The United States is the world's leading producer of both magnesite (magnesium salts) and magnesium metals. Magnesium compounds are recovered from sea water, well brines, and the Great Salt Lake by many companies throughout the United States. Magnesium chloride is produced in San Bernardino County, although Texas is the largest domestic supplier of this compound. Well over half of U.S. production and consumption of magnesium is in nonmetal forms; only 10% of consumption goes for metal applications.

Both metal and nonmetal reserves of magnesium are virtually unlimited throughout the world. Sea water has a magnesium content of 0.13 wt%, making it an enormous reserve of magnesium compounds. Demand for metal sources is expected to increase at a slightly faster rate than nonmetal supplies. In the United States, for example, demand for magnesium metal is expected to increase by 4.3% annually, compared to 3.4% for nonmetallic magnesium.

It is likely that the desert contribution to the supply of magnesium chloride will remain relatively constant and, therefore, of minor importance in the following decades.

Manganese

Manganese is a crucial ingredient in the steel-making process; no substitutes have been found for this metal. U.S. reserves and, hence, production, of manganese are small with the majority of United States requirements met by importation.

Although U.S. manganese reserves are virtually nonexistent, reserves worldwide are large and quite adequate to meet demand in the next 25 years. The United States does have some manganese resources that may become economically feasible to mine in the future. Annual increases in demand of 1.6% for the United States and 2.8% worldwide are foreseen, directly related to anticipated levels of steel manufacturing.

Higher prices or improved technology might make it feasible to mine the low-grade deposits of manganese known to exist in Imperial County. Further exploration might uncover other deposits in the CDCA as well.

Molybdenum

The United States is by far the world's largest producer of molybdenum holding about one-half of known reserves, primarily in deposits in Colorado and New Mexico. This mineral is an important additive used extensively by the iron and steel industry and increasing in value in many other applications. A small amount of molybdenum is recovered as a by-product of tungsten ore in the Pine Creek mine in Inyo County (Minerals Yearbook).

Demand for molybdenum is expected to rise relatively rapidly in the coming years, increasing annually by 4.3% in the United States and by 4.4% throughout the world. The large reserves and resources should be able to handle this increase in demand.

CDCA production is currently declining because lower grade ores are being mined there. However, mining sources believe that molybdenum production will be stable in the long run because other known deposits will be mined and exploration will uncover new deposits.*

Molybdenum is expected to be in greater demand because of growth in the use of alloy steel and because of its potential use in a variety of other applications. Its resistence to high temperature makes it potentially suitable for use in nuclear reactors, jet engines, and rocket nozzles. If efforts to die-cast materials such as molybdenum are successful, demand for die-materials with a high molybdenum content is likely to be great.

Perlite

The United States is the world's leading producer and consumer of perlite, which is used as a filtering agent, insulator, and soil conditioner, among other applications. About 88% of domestic production comes from deposits in New Mexico, although small amounts are mined in California and elsewhere.

No problems are anticipated in supplying future demand for perlite. Although predicted increases in demand are relatively high--between 3.7% and 4.4% annually--reserves and resources are adequate to supply world markets for the next 25 years. Like diatomite, perlite will face increasing future demand in part because of its use in filtering plant effluents.

Inyo County is the sole supplier of perlite in California. Production declined between 1973 and 1974, but increased slowly in subsequent years. Deposits in the CDCA are small, and production is likely to remain stable.

Because many materials are good substitutes for perlite, perlite prices will remain competitive.

Pumice

Oregon and California are the leading U.S. producers of pumice, and the United States leads the world in the production of pumice, cinders, and related materials. A small amount of this supply is produced in Inyo and Kern counties.

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*Personal communications with Mr. Wright of Union Carbide and George Griggs of U.S. Borax, August 1978.

Reserves and resources of pumice and related materials are especially large in the United States, accounting for more than two-thirds of known resources in the world. Demand is expected to increase at a moderate 3.4% annually in the United States and at 3.9% worldwide. Greater treatment of raw materials will probably be required as product specifications become more demanding.

The significance of pumice production in the CDCA is unlikely to change unless demand changes for the types of pumice-containing materials found there.

Rare-Earth Minerals

The United States became self-sufficient and a leading exporter of rare-earth concentrates and compounds when a large rare-earth deposit of bastnaesite was discovered in the California Desert. San Bernardino County supplies about 97% of the U.S. output of rare-earth minerals.

Some members of the rare-earth group are relatively abundant in the world, and some are considered to be scarce. The United States has approximately three-fourths of the total world resources of rare-earth elements. Future demand increases are expected to be moderate; 2.8% annually in the United States, and 3.7% annually worldwide. The iron and steel industry is the principal area likely to increase its demands for these substances.

Bastnaesite from the desert is expected to continue to play a major role in the world market. In addition new uses for rare-earth minerals are rapidly being discovered as well, and these minerals will probably come to be mined even more extensively.

Salt (Sodium Chloride)

The United States is by far the world's largest producer of salt. Louisiana and Texas account for roughly half of this supply; California supplies very little. Some production does come from Imperial, Kern, and San Bernardino counties, however. All of the state's production is recovered as evaporated salt, although a small quantity is then crystalized to produce rock salt.

Demand for salt is expected to increase annually by 4% in the United States and by 5.8% worldwide. Accelerated demand is expected in the rest of the world as development occurs. Salt reserves and resources are plentiful throughout the world, except in Japan. No shortage of salt is anticipated.

Production of salt in the CDCA area is likely to remain stable. Environmental pressures, however, to return San Francisco Bay and its estuaries to their natural condition may reduce the salt produced in this region, thereby increasing demand for supplies from the CDCA.

The widespread use of salt along with the limestone to remove sulfur dioxide from stack gases is also likely to increase future demand for salt.

Sand and Gravel

Sand and gravel are the major construction materials used in the United States and the fastest growing mineral industry as well. The United States is the largest producer worldwide, and California ranks second in domestic suppliers. About 8% of the state's total value of sand and gravel was produced in the CDCA portions of Imperial, Inyo, Kern, Riverside, and San Bernardino counties.

Supplies of sand and gravel are unlimited throughout the United States and probably the world, although not necessarily in locations where they are needed. Demand is expected to increase annually by 2.8% in the United States and by 3.5% in the world. Judging from past trends, domestic production will meet demand.

Sand and gravel production is likely to increase at a moderate rate in the CDCA. Because most of the sand and gravel produced in the CDCA is used in the construction business in Southern California, the future of this product is a function of growth in this area. Recent planning policies that emphasize slowing growth in the southern metropolitan areas could also slow the demand for sand and gravel as well. Another problem faced by the industry there is the problem it faces everywhere: possible land-use conflicts due to urban growth and environmental problems.

Silver

The United States ranks fifth in the production of silver, behind the USSR, Canada, Mexico, and Peru. California is not a leading supplier; however, some quantities of silver are mined in Inyo, Kern, and San Bernardino counties--primarily as a by-product of tungsten, lead-zinc, and gold ore. Before 1960, the CDCA produced a large portion of California's supply of silver. Production since 1960 has declined substantially, with considerable yearly fluctuations. As the production of minerals from which silver is recovered as a by-product has declined, so has the recovery of silver. Thus, future production will depend in part on the production of tungsten, lead-zinc, and gold.

Demand for silver has been rising faster than production for most of the last 20 years. Participated increases in demand are modest; 1.7% annual growth in the United States (averaging both primary and secondary demand), and 2.0% worldwide in the next 25 years. Nonetheless, silver will continue to be much in demand: in the photography business where intensive research has failed to produce acceptable substitutes; in silverware, jewelry, and the arts, because the higher price of gold makes silver an attractive alternative; and in batteries, electric, and electronic components, especially if new types of silver batteries are designed and widely marketed.

World reserves are not sufficient to meet projected needs to 2000. Thus, silver prices will probably continue to rise, creating incentives to recover more secondary silver and develop deposits currently considered resources. Total world resources are only slightly higher than cumulative demand to 2000. Unless major technological breakthroughs occur or large new deposits are found, silver will be in short supply in the coming years.

A recent article in World Mining ("Large Low-Grade Silver Deposits in North America") discusses two significant reserves of low-grade silver in the California Desert, known as the Langtry and Waterloo deposits. If the price of silver continues to increase rapidly, it is very likely that these and other low-grade deposits in the United States will be mined before 2000. This would increase the CDCA's significance in the production of silver.

Sodium Carbonate (Soda Ash)

Wyoming and California supply all of the natural soda ash produced in the United States--about one-third of the world's supply and the only known reserves of natural soda ash in the world. Other states produce synthetic soda ash, but this industry is declining rapidly because of the high cost of fuel and raw materials. In contrast, the production of natural soda ash is booming. Production in the rest of the world is predominantly synthetic soda ash.

Future demand, which is expected to increase by 3.0% annually in the United States, is assured. Other countries will depend on the synthetic product to meet their projected 3.7% annual increases.

If the rising costs of inputs and environmental restrictions make foreign production of synthetic soda ash too expensive, Europe and Asia might increase imports from the United States. Resources of the Searles Lake in San Bernardino County are extensive and might be called on to provide more of the world supply. Thus, soda ash production in the CDCA could assume a greater significance especially in view of the $100 million expansion and construction program at the Trona plant in San Bernardino County (Minerals Yearbook).

Sodium Sulfate

Although the United States is first in production of sodium sulfate, about 16% of that consumed each year is imported to meet the needs of the pulp and paper industries. California is one of the leading domestic producers, because of the reserves of Searles Lake in San Bernardino County.

No demand projections have been made for sodium sulfate. Industry sources, however, say that the market outlook for sodium sulfate is very poor and that demand is expected to remain stable at best. This is due

to a declining demand from the paper industry (which uses sulfate to make sodium sulfide) because sulfate is a large contributor to industrial water pollution. U.S. reserves and resources for this mineral are adequate, but worldwide suppliers cannot handle future demand.

It may become profitable to increase production in the CDCA area to make the United States more self-sufficient. Reserves are large enough in the Searles Lake to ensure an adequate base for expanded production. Current construction activities at the Trona plant in San Bernardino County will expand output of sodium sulfate by a small amount (Minerals Yearbook).

Stone

The United States produces about one-fifth of the world's supply of crushed and broken stone but only a fraction of the supply of building stone. California is not a leading domestic producer, but small quantities of crushed and broken stone come from all of the counties in the CDCA.

Demand for crushed and broken stone is expected to increase at a moderate 3.2% in the United States and 4.0% in the world in the coming 25 years. Resources domestically and worldwide are considered inexhaustible. Stone will always be available, as long as urban expansion and environmental controls do not hinder the industry.

Prices have been declining in constant dollars because of more efficient methods of production. In spite of this, in recent years revenues from stone production in California have been increasing steadily relative to output. The CDCA will probably retain its importance as a supplier of stone to the metropolitan areas of Southern California.

Talc

Talc, soapstone, and pyrophyllite are produced largely in Japan and the United States. California is an important, though not leading, producer of these minerals. In Southern California, production comes from six mines in Inyo County and seven mines in San Bernardino County.

Demand for talc and related minerals is expected to increase at a faster rate in the rest of the world (3.8%) than in the United States (2.9%) because of the lack of substitutes for this mineral. Reserves and resources have not been precisely estimated, but resources are thought to be quite plentiful and widely distributed. No shortages are anticipated among any of the talc mineral groups in the next 25 years.

The market for talc and related minerals is likely to be stable; however, the contribution of the CDCA is expected to decline in the future, because of the undesirable high asbestos content of the talc produced in the desert. In fact, two or three mines have shut down recently for this reason.

Tungsten

California is the largest domestic producer of tungsten, making the United States the world's third largest supplier. About two-thirds of U.S. production comes from California and 99% of this originates from one mine* in Inyo County (Minerals Yearbook). Colorado and Nevada account for most of the tungsten produced outside of California.

Future increases in demand are expected to be higher in the United States (4.4% annually, averaging primary and secondary demand) than in the rest of the world, where increases are expected to average 2.7% annually. This is due to anticipated expanding uses in the U.S. machine tool, construction, and mining machinery industries.

Current reserves are not adequate to meet higher future demands, either domestic or worldwide. Two possibilities exist for increasing the supply of tungsten: one is augmenting secondary recovery efforts and the second is making the recovery of tungsten from the brines of Searles Lake economically feasible.

The ability to recover tungsten from Searles Lake would increase domestic reserves by an estimated 50%-60%. Clearly, this would give the CDCA a stronger role in the world tungsten market than the small share it already possesses. Given anticipated strong demand and inadequate supplies, the CDCA should be able to command increasingly larger revenues from its share of tungsten. Also, there are many known deposits in the desert that will become profitable to mine as the price increases.

Future demand for tungsten will continue to be dominated by its use for filaments and tool bits. Like molybdenum, the value of tungsten lies in its strength at high temperatures. If advances are made in making tungsten more resistent to oxygen at high temperatures and less brittle at room temperature, the demand for this metal can be expected to increase.

Uranium

Although the United States ranks first in the world production of uranium, none of this supply currently comes from California. However, interest in mines discovered in California in the 1950s and 1960s has been renewed, and these mines have recently been investigated with the idea of reopening them (Minerals Yearbook). One of the mines of interest is the Coso deposit in Inyo County.

Projected demand forecasts for uranium are high. Probable growth rates are annual increases of 8.9% in the United States, and annual increases of 9.1% worldwide, based on the increasing role of nuclear power as a source of energy. No good substitutes have been found for uranium, which is used to fuel the nuclear reactors. Supply seems adequate for the short-run, but it is uncertain in the long-run. World

*The Pine Creek Mine is not in the CDCA.

reserves and resources, as presently listed, are not adequate for numerous reactors. Prices have been rising sharply in the recent past, stimulating interest in low-grade deposits and the discovery of new mines.

Threatened shortages of uranium, coupled with rising prices, could make uranium production in the CDCA a profitable operation. Many uncertainties cloud the future market, however, such as the possible development of a breeder reactor that uses no uranium and the possibility that some of China's extensive uranium supplies might enter the world market.

Vanadium

The United States ranks third in the production of vanadium, behind the USSR and the Republic of South Africa. Like molybdenum, this mineral is principally used as a strengthener in steel and iron production, with small but important applications in the chemicals industry. California is not a major producer.

To keep abreast of the production of iron and steel, demand is expected to increase rapidly at rates of 5.1% in the United States and 4.4% elsewhere. World reserves and resources are adequate to last to and beyond 2000, with large resources contained in all of the major producing nations.

Vanadium is a by-product of uranium and is not currently produced in the CDCA. Because of the abundance of the mineral elsewhere, prices are expected to remain stable, and no incentives are anticipated to spur desert production of this mineral.

Zeolite

The United States consumes only a few hundred tons of natural zeolite annually (Mining Engineering, March 1976). Much of the U.S. production comes from Arizona deposits, although small amounts come from the California Desert as well.

Zeolites are principally used in the cement industry for pozzolan compounds in the United States and elsewhere in the world. More synthetic zeolite than natural zeolite is used in the United States, although other countries, such as Japan and Italy, use natural zeolites extensively for their value as catalyst and adsorbent.

The United States is self-sufficient in natural zeolites, producing only a few hundred tons of natural forms such as clinoptilolite, chabazite, and erionite annually. Most of the U.S. production of natural zeolite comes from Arizona deposits, although small amounts come from San Bernardino County, near Hector, California, in the California desert (Industrial Minerals and Rocks, 4th Edition, 1975). Predictions call for a "modest

but continuing growth through the next decade as other uses currently being tested are put into use" (Mining Engineering, March 1976). In fact, demand for natural zeolites will skyrocket in the near future if zeolite partially replaces phosphates in the detergent industry (Chemical Week, October 19, 1977). One industry representative anticipates a ninefold increase in the demand for zeolite between 1975 and 1981 if this mineral is used in detergents (European Chemical News, November 25, 1977).

The price of natural zeolites is kept at an artificially high level currently, to support the price of synthetic zeolites, which can be manufactured to suit the customer's need, but are more expensive to produce than the natural product. Observers of the industry all predict that market forces will act to restore the price of natural zeolite to a lower, more competitive price (Industrial Minerals and Rocks, 1976, and Mining Engineering, March 1976. Resources of natural zeolites were estimated by one expert at about 10 million tons in the United States alone (Industrial Minerals and Rocks, 1976). Known reserves and new deposits will probably be sufficient to handle large increases in demand; however, time would be needed to increase production to sufficient levels. Deposits in the CDCA will become an increasingly important source of zeolite under conditions of moderate demand increases; even more so if zeolite detergents become a reality.

Zinc

U.S. zinc production ranks fourth in the world, with mines in New York, Missouri, and Tennessee. Even so, the United States imports roughly half its yearly zinc requirements. Small amounts of zinc are mined in Inyo and San Bernardino counties.

Although current, domestic and international zinc resources are not adequate to handle cumulative demand until the year 2000, new reserves are expected to be developed that will provide an adequate supply. Anticipated increases in demands are a moderate 2.5% in the United States and 2.2% worldwide.

The zinc content of ore in the southwest (including California) is a relatively low 2.8% zinc per million short tons of ore. This, coupled with the fact that zinc deposits in the desert are not large, suggests that the CDCA will not become an important source of zinc.

New zinc-aluminum alloys have been developed recently that have been proposed as substitutes for steel. Other new applications for zinc in die casting and paints are expected also, all of which will increase future demand for this metal.

VI TRENDS IN RECREATION AND TOURISM USE AND EXPENDITURES IN THE CALIFORNIA DESERT, 1975-2000

Recreation and tourism in the California Desert Conservation Area (CDCA) will continue to grow in economic significance during the remaining years of this century. Numerous forces and developments will affect the desert itself and the activities carried out in its environment. They include:

- Increasing demand for outdoor recreation, resulting from: population growth; more leisure; increased disposable income; population concentration; and desires of nearby city dwellers to escape from urban congestion, stress, and work pressures to the comparative freedom and simplicity of the desert environment
- Technological developments in transportation, communications, recreational vehicles (RVs) and equipment, outdoor gear, desert shelter, foodstuffs, and other items that will make it easier, safer, and more enjoyable to participate in recreation and travel in the desert
- Development of clear-cut management policies and responsibilities that will allow federal, state, and local governmental agencies to manage the resources and activities in the CDCA in an increasingly efficient and sensitive manner
- Development of additional facilities and attractions that will supply recreation users and travelers with increased opportunities to engage in worthwhile desert pursuits.

These trends and forces, working together, will lead to growing recreational and travel activities in the California Desert. However, the mix of activities is likely to change, and effective management will be essential. Differing political and policy considerations can have profound effects in encouraging or discouraging recreational use and growth.

The remainder of this chapter estimates future visitor use and spending in the CDCA and discusses the underlying forces and trends that will affect these projections.

Desert Visitor Expenditures

An estimated 14.4 million people visited the CDCA during 1977 for recreation and pleasure. In total, they spent nearly $325 million during their stays, and these expenditures supported more than 10,000 jobs and payrolls exceeding $80 million (John Ryan et al.).

Visitor growth resulting from increases in the population of Southern California is anticipated to be at least 1.5% annually. With growing affluence, more technological developments, better management of desert resources, and the development of new desert attractions, this rate of growth should increase to between 3.5% and 5.0% annually. Thus, those visiting the California Desert should range between 22.5 million and 27.2 million in 1990; by 2000, desert visitors should number between 31.8 million and 44.2 million. Should substantial restrictions on recreational use be imposed on desert areas, the rate of growth will be significantly reduced. However, because more than 85% of current visitors and recreational users of the desert do not use BLM lands, future federal and state policies and actions affecting travel by automobile, visits to national monuments, and use of private and state lands and attractions will outweigh any BLM policies in overall effect.

The rate of visitor expenditures is expected to rise more rapidly than increases in the numbers of visitors because of increasing affluence, inflation, and other economic factors. However, even in constant 1977 dollars, visitor expenditures should exceed $600 million in 1990 and total approximately $1 billion by 2000. In contemporary dollars, based on an annual inflation rate of 6%, visitor expenditures in 1990 should amount to about $1.3 billion, and in 2000 to $3.6 billion. As at present, businesses in desert communities are expected to be the major beneficiaries of these expenditures. Depending on BLM policies in regard to developing and granting concessions to service industries on BLM lands, the share spent on BLM lands could range between 2% and 10% of total visitor expenditures.

Expenditures in the desert are principally generated by tourism in the Palm Springs area. This situation is expected to continue for the next two decades and beyond. Tourists generally pay for accommodations, food, entertainment, and shopping, whereas recreational users to BLM lands must provide their own food and lodging. In 1977, an estimated 57% of all visitor expenditures in the CDCA were made by visitors to the Palm Springs-Indio area. Tourists interested in sightseeing, comfortable accommodations, and more urban types of recreation such as golf and tennis spent an estimated 80% of all monies spent in the desert by visitors during 1977. Unless major plans are formulated to provide facilities and services to recreationists that would substantially change current RV owning and travel patterns, a similar percentage should be spent by tourists to Palm Springs and other desert resorts by 1990 and 2000. In constant value 1977 dollars, tourists should spend about $480 million in 1990, compared with recreationists' $120 million. By 2000, tourists are projected to spend $800 million and recreationists $200 million.

Policy Assumptions

With the passage of the Federal Land Policy and Management Act of 1976, a national policy to retain and manage U.S. resource lands was established. Retention and management include the implementation of a comprehensive long-range plan for the management, use, development, and

protection of the public lands within the CDCA (Public Law 94-579). The enabling act indicated that desert resources should be managed to

> conserve these resources for future generations, and to provide present and future use and enjoyment, particularly outdoor recreation uses, including the use, where appropriate, of off-road recreation vehicles. (Bureau of Land Management.)

The provisions of this act are assumed to provide policy guidelines that will act as a framework for program development until the end of the century. Obviously, a major change in policy, such as a decision to sell BLM-administered lands in the CDCA to private enterprise or to eliminate recreational use by off-road vehicles (ORVs) would be hotly disputed. Such a change in policy, particularly in view of recent legislation and concerns for the long-range preservation of the desert for future use, is not foreseen. Thus, in this report trends for future use are based on continuation of the recently announced national policy.

Population Growth in the CDCA and Southern California

California's population is projected to increase by approximately 8.1 million between 1975 and 2000--from 21.2 million to 29.3 million. More than 25% of this growth will occur in Los Angeles and Orange counties, and more than 50% will occur in the Southern California counties of Los Angeles, Orange, Ventura, Riverside, San Bernardino, and San Diego. By 2000, the population of the 10 Southern California counties (including Imperial, Inyo, Kern, and Santa Barbara) will be 17.3 million, compared with 12.6 million in 1975. Obviously, an increase of 36% in the resident population over 25 years (even though the annual rate of increase is small at 1.25% per year) will accelerate recreation and travel demands, including use of the desert.

Population growth in the CDCA will be even more rapid, on a percentage basis, than elsewhere in Southern California. Growing congestion, scarcity of developable land, social problems, and similar factors in urban centers will help foster peripheral growth in the desert. There, resident population is projected to increase 63% between 1976 and 2000, at an annual rate of 2.06%. Because desert populations generally find much of their recreation nearby, recreation demand in the CDCA will probably increase at a more rapid rate than population growth in general, more likely at least 1.5% annually or 25% by 1990 and 45% over 1975 totals by 2000.

In addition to the increased recreational and travel demand attributable to general population growth, changing population structure will also foster increases in demand for desert recreation. During the next two decades, more heads of California households will be in the "family" stage of life between the ages of 25 and 45. These are vigorous years of work, recreation, and raising families. Because many desert recreational activities are essentially family activities, the growing numbers of people in this 25 to 45 age category will tend to increase demand for desert recreation, as well as other forms of recreation in Southern California.

The number of retired people will also continue to increase during this period. Many will seek to enjoy desert recreation and sightseeing of a less active nature than their younger counterparts--birdwatching, painting, photography, camping, rock hunting, and education and research activities. Others will continue seasonal travels in motor homes, trailers, and recreational vehicles, spending longer periods in the desert during winter when the weather is mild and the environment is accommodating.

Economic and Sociological Influences on Demand

Real personal income is projected to increase at a rate of 3.4% annually (National Planning Association, 1977) among residents of the western United States from 1976 to 2000. Future residents of California and nearby states will be increasingly affluent and have more disposable income available for recreational and travel pursuits. However, employment security and feelings about job advancement opportunities will not improve. Thus, "getting away from it all" in a totally different environment from the everyday work/home situation will lure many to the California Desert.

As population increases in Southern California urban areas, greater housing densities, increasing congestion, more noise and pollution, and greater complexity in everyday living will result. These factors, also, will tend to make the desert more attractive as an environment of contrast and aesthetic enjoyment. In addition, recent inflationary periods have led to substantially increased real estate values and shortages of developable property for single-family homes that can be bought by first-time purchasers. This has led, and will continue to lead, to the construction of many multifamily dwellings in areas characterized by congestion; the contrast of these locales with wilderness and desert areas thus becomes even more evident. Continued inflation will also tend to increase demands for recreation in more primitive and uncrowded natural environments such as the deserts and mountains of Southern California, because camping out is cheaper than staying in hotels and eating in restaurants.

Trends toward more flexible work periods will continue through the 1980s and 1990s. The 4-day work week will become more prevalent; the 3-day work week, with two cadres of employees each working 3-day periods, will come into its own during the 1990s. Innovations such as job sharing, flextime, and other means of working harder and longer during certain periods and thereby having longer blocks of leisure available will also become more widespread. Having more time to pursue recreational and travel interests will lead more people to enjoy desert recreational activities. Increased affluence and leisure will lead to the purchase and use of larger, more comfortable, and more expensive RVs and equipment for desert use. Increased frequency of use should also result.

The role of family activities in the society of the 1980s and 1990s is difficult to predict. In recent years, birth rates have fallen, divorce rates have risen, and increasing numbers of households have been

formed with no thought of marriage and family. However, recent data indicate that birth rates have once again begun to rise; thus, it is uncertain that the trends of the 1960s will continue. Increased realization of the significance of family-centered activities as the basis of American society should grow within the next two decades and this should lead to greater family use of the California Desert. Should deterioration of a family-centered society occur, however, decreased use of the desert for such activities would result.

Desert recreationists generally fall within one of two groups: wilderness-oriented or vehicle-oriented users. The wilderness users wish to conserve the desert's environmental quality and the natural resources. Vehicle users also express these concerns and hold other values as well. Among the values held by both groups are:

- Aesthetic values--seeing the beauty of the natural areas they visit
- Skill-building values--developing mental and physical skills that give pleasure during their attainment and use in the field
- Psychological values--enjoying a sense of freedom, escape from the real and imagined tensions and from the constraints of day-to-day living, and the exploration of new and interesting country
- Social values--socializing with others of similar interests and backgrounds, an important factor in binding families together by uniting them in a common interest
- Supportive values--engaging in camping, fishing, hunting, rock collecting, nature study, and other activities
- Risk taking--experiencing risks while exploring or riding over difficult terrain (California Department of Parks and Recreation).

Freedom of movement, the constraints of urban life, participation in supportive activities, and the positive social and family values and goals attained appear to be the most significant factors influencing the future use of the desert by vehicle-oriented users and perhaps by others as well. The mystical and/or spiritual significance that the desert holds for some appears to be a related value; some people use desert visits to retreat from other people as well as for recreation and aesthetic appreciation. Preserving and managing the desert so that visitors can continue to find these and related values available will require considerable attention.

The initial volume of the U.S. National Travel Survey for the first quarter of 1977 confirms previous surveys and studies that conclude that travel by air and for business is much more common among upper income families in professional and managerial occupations than for middle-income sales and blue-collar workers (U.S. Bureau of the Census). On the other hand desert recreationists, particularly those engaged in vehicle-oriented activities, are from working and middle-class backgrounds.

They are mostly high school graduates and include skilled workers, service workers, and managers--many of whom live in major California metropolitan areas (California Department of Parks and Recreation). The data from the National Travel Survey tend to emphasize the diverse nature of desert visitors and users and call for clear-cut programs and policies that assure opportunities for a variety of users whose purposes and values may, at times, overlap or conflict.

Significance of Energy Availability and New Technology

It is estimated that as much as 50% of the gasoline consumed in California is used for recreational and social driving. Thus, the availability and cost of energy resources, especially gasoline, will be important influences on future demand and participation in recreational pursuits at some distance from urban population concentrations. A recent SRI study (J. W. Waters) has concluded that fuel costs will rise by at least 7% per year over the next decade, but that this rise will not depress sales of automobiles, trucks, and RVs used to transport residents to and from desert recreation areas. Only about 0.25% of the gasoline consumed in California (about 70 million gallons annually) is used for dune buggies, motorcycles, 4-wheel drive vehicles, snowmobiles, and other ORVs. Consequently, availability and cost of gasoline and other fuels will not discourage purchase and use of these vehicles in the California Desert.

Severe shortages of gasoline, such as that which occurred during 1973-74, are not predicted. Should less serious cutbacks in supply or availability occur, however, recreational travel could suffer. Increasing dependence on foreign petroleum sources and the absence of a clear national policy and commitment to develop alternative energy sources are the causes of uncertainties in recreational trends that cannot be clarified until the direction of U.S. energy development also becomes clear.

New technology will affect RVs and other recreational equipment used in the desert. In general, such equipment should make desert travel and desert recreational activities safer, more comfortable, and more enjoyable in future years and thus stimulate recreational and travel demand.

Future RVs are expected to be better engineered, more comfortable, and more adaptable to desert environments. New wall materials will be lighter, stronger, better insulated, less flammable, and less costly. Air conditioning units, appliances, and generators will be improved. Diesel and turbocharged engines will become more widely available. In the mid-1980s, continuously variable transmissions will be introduced in RVs, and antiskid brakes will become available options. However, RVs' towing and hauling capabilities will be reduced and the use of larger travel trailers and motor homes will decline in favor of smaller mini-motor homes and van conversions. Development of four-stroke engines and diesel-powered motorcycles will increase sales and use of dirt bikes and

other ORVs in California. A number of exotic vehicles such as ground effect machines and jet backpacks will become available but may be too expensive for mass appeal and widespread use.

Important technological developments will also take place in shelter construction and use. In addition to RVs and vans, portable shelters of lightweight materials will become available, and clothing and equipment designed especially for desert use will be developed. Waste and water cycling devices, lightweight communications and environmental control equipment, and camping gear will all be considerably improved to make camping, hiking, climbing, and similar desert activities safer, more comfortable, and more enjoyable.

At some time during the next quarter century, breakthroughs in water and energy technology could occur. Such developments would lead to the development of more tourist destination areas in the desert, with associated urban recreation facilities, such as golf courses, tennis courts, lakes, and entertainment facilities. Availability of inexpensive power to produce controlled environments and sufficient water to meet projected demand would be essential to any major development of this type. Microprocessor control systems that control shelter environments and manage sensors will also be increasingly available.

Management and Regulatory Considerations

One of the major attractions of the California Desert has been its wild, undeveloped state. Under present land use legislation and regulations, not only desert resources but RVs and other elements that play a role in the desert recreation are likely to be subject to considerable regulation. Thus, multiple use management that satisfies the increasing, and sometimes conflicting, demands of different categories of desert users will become essential.

Federal energy efficiency regulations will seriously reduce passenger car trailer-hauling abilities initially, with later extension to light trucks and vans. Within the next decade, it is probable that minimum miles-per-gallon (mpg) requirements may be introduced for all vehicles, thereby withdrawing manufacturers' present option of balancing low and high mpg units. A tax on vehicles that consume excessive amounts of gasoline is possible, and emission compliance requirements will become more stringent. Emission control requirements imposed by California may, in fact, jeopardize diesel engine options because of stringent NO_x and particulate limits.

Local regulations affecting the ownership, use, and parking of RVs and other specialized vehicles will become more stringent in many California communities. Increased safety regulations to prevent accidents due to careless driving of desert vehicles, drunken driving, and driving by minors without adequate vehicle training and experience will be imposed. Regulations designed to separate different types of recreational uses (e.g., motorcycles, sand sailboats, dune buggies, and jeeps)

will be imposed. Safety inspections of custom-made vehicles and equipment such as hang gliders, gyrocopters, sand sailboats, and others will be necessary. Permits may also be required for such activities as rock hunting, birdwatching, backpacking, and picnicking in desert areas.

Most of these regulations will be imposed for safety reasons and to reduce littering, vandalism, the disturbance of livestock, damaging crops, noise pollution, soil and vegetation damage, and similar problems that have been attributed to desert recreationists in the past. In the long-run, however, such regulations will be accepted as necessary for the preservation of recreational resources that cannot be duplicated elsewhere.

The preparation and implementation of a comprehensive, long-range plan for the management, use, development, and protection of the public lands within CDCA will substantially influence both demand and supply. The plan will probably contain provisions to limit certain types of recreation in given areas of the desert. These will reduce demand by limiting supply. Some potential users may, instead, shift their recreational interests to Mexico, other nearby states, or different types of recreation. Development of better facilities and services in the CDCA, however, will tend to stimulate demand and induce new users to develop recreational interests that can be satisfied in the desert.

At present, few specialized maintenance and repair services, retail food and drink suppliers, and other suppliers are available in the CDCA and the number of commercial overnight accommodations suppliers is decreasing. Development of plans and programs that would induce private investment in recreational destination areas would increase employment opportunities and stimulate further tourism and recreational developments. It is not known to what extent BLM plans and actions will curtail or regulate recreational activities. However, plans that lead to development of additional facilities and services could substantially affect demand, future recreational activities, and travel within the CDCA.

Availability of Land and Supply of Recreational Resources

Of the 103.6 million acres of land in California, 54.1 million are in public holdings and 49.5 million in private holdings. The federal government holds title to 46.2 million acres, including 20.0 million by the U.S. Forest Service and 15.6 million by the BLM. The bulk of Forest Service holdings is at elevations of 2,500 feet or above in the Sierra Nevada, the Coast Range, and the mountains of Northern and Northeastern California--nearly all of these areas are remote from the major population centers of Southern California. Much of the Forest Service land is also moderately to heavily forested and of rugged topography, which makes it attractive for recreational activities like backpacking and hiking but discourages vehicle-oriented activities like motorcycling and sand sailing. By contrast, the bulk of the BLM land is in the deserts of Southern California, with smaller holdings throughout the valley grasslands and

mountain foothills of the northern part of the state. The major BLM holdings are arid and generally open, with variable surfaces that include sand dunes and dry lake beds to which vehicle access is relatively easy. BLM holdings are both nearer major centers of demand as well as more easily accessible for a variety of activities. They are thus most easily usable on weekends and during holiday periods, enabling nearby residents to drive to the desert for recreational pursuits and return home within a limited time.

California holds title to about 2.3 million acres of land and 3.4 million acres of water surface. Most of the properties in the State Park System are relatively small and scattered throughout the state, mostly in coastal areas. California's Department of Parks and Recreation has been oriented toward environmental and historic preservation, emphasizing traditional forms of outdoor recreation, such as swimming, camping, and picnicking when appropriate. Currently, four state vehicular recreation areas (SVRA) are being developed, including the Ocotillo Wells SVRA within the CDCA; ORVs are permitted in designated areas of three other state parks and state recreation areas within the CDCA--Anza-Borrego Desert State Park, Picacho State Recreation Area, and Red Rock Canyon State Recreation Area.

California, like the federal government, has been increasingly interested in planning and managing state land resources in recent years and has proposed an exchange of school grant lands (Sections 16 and 36 of each surveyed township, except where these sections were already encumbered before statehood) for lands currently held by BLM, the Forest Service, and the Department of Defense. Approximately 400,000 acres of these state-held school lands are in San Bernardino, Riverside, and Imperial counties, interspersed with lands covered by BLM's Desert Management Plan; the remainder, which are few in number, are scattered throughout the northern counties. To solve the management problems of administering scattered lands, the State Lands Commission has proposed three alternatives to the present land tenure system: (1) selling the school lands held by the state to private buyers, (2) consolidating state land into large blocks in an exchange program with the BLM, and (3) consolidating state land outside the heart of the CDCA, together with a federal land-grant program to increase state holdings by 3 to 5 million acres (California State Lands Commission). Any of the alternatives would potentially affect recreational use of the desert by making these state lands more available for public use; however, government restrictions and controls on their use may also be imposed.

Unless California is able to obtain major exchanges or grants from the federal government, the state's role in providing land and facilities for extensive vehicle-oriented recreation will be limited. With few exceptions, California counties, cities, and special districts are also minor landholders of recreation properties. The majority of local jurisdictions found it difficult to finance the operation of existing park and recreation facilities even before the recent passage of a tax initiative measure that limits revenues from property taxes; thus, they are not likely to play a significant role in developing outdoor recreation facilities during the next decade or so.

To date, a number of vehicle parks have been developed by private landholders. However, these parks are largely limited to motorcyclists; dune buggies and four-wheel drive vehicles, as well as more specialized vehicles, generally need more land than is available in private facilities.

BLM appears to be the only agency with sufficiently large land holdings to supply the needs of outdoor recreation enthusiasts who require varied recreational environments and experiences. Continued use, in one form or another, of the California Desert for recreational purposes, therefore, appears to be essential. Current legislation requires that BLM impose controls or limitations on recreational use of its lands. Demand for BLM land and facilities will continue to grow. Such growth will benefit the California economy by affording new jobs and other opportunities.

Travel Through the California Desert and to Tourist Centers Within It

In addition to recreational use, increasing travel for pleasure will also affect the desert. Tourist centers like Palm Springs will continue to attract seasonal and short-term visitors, and pleasure travelers will continue to drive across the desert to such centers as Las Vegas, Colorado River resorts, and Mexico. Sightseeing in Death Valley and the Joshua Tree National Monument will continue to expand, and new resorts and motel accommodations will likely be developed.

The automobile is currently the predominant mode of transportation in the United States. Approximately 80% of travel (trips greater than 100 miles or overnight) is currently by automobile, and this dominance is expected to continue over the next two decades. Because nearly any long-distance route in and out of Southern California from east to west must traverse the desert, increasing numbers of people will cross the desert, some of whom will stop at places of interest within it. Automobile travel by Californians to the interior of Mexico also requires a trip across a portion of the CDCA. More and more residents of both California and Mexico will undertake such travel in years to come, particularly as the economic development of Mexico continues and its petroleum and other resources are exploited.

Travel to desert locations for conventions and other business meetings will also increase as business and pleasure are combined as sites where both can be carried out conveniently grow in significance. Such travel will be particularly important during low-sun winter periods.

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Appendix A

SUPPLEMENTAL DEMOGRAPHIC DATA

Table A-1

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR MARKET AREAS IN KERN AND LOS ANGELES COUNTIES, 2000

	Kern County				Los Angeles County	
	Market Area 3		Market Area 6		Market Area 6	
Age Group	Male	Female	Male	Female	Male	Female
0-4	4.3%	3.9%	4.8%	4.2%	3.6%	3.5%
5-9	4.5	4.1	4.7	4.5	4.3	3.5
10-14	4.8	4.3	4.7	4.6	5.2	5.0
15-19	3.9	3.4	3.5	3.3	4.3	4.0
20-24	4.3	3.1	7.3	4.0	2.6	2.5
25-29	3.4	3.1	3.4	3.2	2.5	2.6
30-34	4.0	3.6	4.4	4.3	3.3	3.6
35-39	4.7	4.5	5.7	4.9	4.4	4.3
40-44	4.8	4.3	3.5	3.2	4.4	4.0
45-49	4.5	3.6	2.7	2.6	4.1	3.8
50-54	3.3	3.0	2.4	1.9	3.9	3.2
55-59	2.2	2.1	1.5	1.6	2.9	2.3
60-64	1.2	1.3	1.2	.9	1.9	1.6
65-69	.7	.9	.7	.8	1.5	1.4
70-74	.5	.7	.5	.6	1.1	1.1
75+	.5	1.2	.5	1.2	1.1	2.0
Total Population	28,000		32,000		198,000	

Source: SRI International

Table A-2

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR
MARKET AREAS IN RIVERSIDE COUNTY, 2000

Age Group	Market Area 11		Market Area 12	
	Male	Female	Male	Female
0- 4	3.3%	3.1%	4.2%	4.3%
5- 9	3.3	3.1	4.0	4.2
10-14	3.6	3.3	4.6	4.7
15-19	3.5	3.2	3.8	4.1
20-24	2.4	2.5	2.4	2.7
25-29	2.6	2.5	2.5	3.1
30-34	2.8	2.7	3.6	3.5
35-39	3.4	3.4	4.3	4.1
40-44	3.9	3.8	4.3	4.4
45-49	3.8	3.9	4.1	3.5
50-54	3.5	3.8	3.3	3.1
55-59	3.7	3.8	3.0	2.8
60-64	3.4	3.4	2.2	1.7
65-69	2.6	2.7	1.4	1.3
70-74	2.0	2.2	.7	.7
75+	2.6	3.9	1.1	1.8
Total Population	197,700		20,500	

Source: SRI International

Table A-3

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR MARKET AREAS
IN SAN DIEGO AND IMPERIAL COUNTIES, 2000

Age Group	Market Area 13		Market Area 14*	
	Male	Female	Male	Female
0- 4	2.3%	2.1%	4.1%	3.9%
5- 9	2.6	2.3	4.4	4.2
10-14	2.9	2.4	4.8	4.5
15-19	2.9	2.4	4.4	4.3
20-24	1.2	1.2	2.8	3.0
25-29	1.4	1.2	2.7	2.8
30-34	1.4	1.3	3.1	3.3
35-39	2.9	3.0	3.9	4.0
40-44	2.9	3.0	3.6	3.8
45-49	4.7	5.4	3.8	3.9
50-54	4.1	4.9	2.9	3.1
55-59	5.8	5.9	2.3	2.6
60-64	4.9	5.1	1.8	2.9
65-69	6.3	4.0	1.4	1.7
70-74	3.1	3.5	1.1	1.5
75+	1.7	2.7	0.8	2.7
Total Population	3,000		129,000	

*Market Area 14 is Imperial County.

Sources: SRI International and California Department of Finance, "Population Projections for California Counties 1975-2020 with Age/Sex Detail to 2000"

Table A-4

AGE-SEX DISTRIBUTIONS FOR MARKET AREAS
IN SAN BERNARDINO COUNTY, 2000

Age Group	Market Area 3		Market Area 5		Market Area 7		Market Area 8		Market Area 9		Market Area 10	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0- 4	4.2%	4.3%	5.1%	4.2%	4.0%	3.8%	5.1%	4.2%	2.5%	2.4%	3.2%	2.8%
5- 9	4.2	4.2	3.6	4.7	4.3	3.9	3.6	2.7	2.6	2.5	3.0	2.9
10-14	4.6	4.1	3.6	3.2	4.3	4.2	3.6	3.2	2.7	2.7	3.5	3.3
15-19	3.3	3.5	2.9	2.6	3.9	3.8	2.9	2.6	5.3	2.5	3.7	3.9
20-24	3.3	2.9	2.5	2.9	6.3	3.4	2.5	2.9	8.1	2.5	3.5	3.1
25-29	3.2	3.0	3.8	3.1	3.2	3.0	3.8	3.1	2.3	1.8	2.4	2.2
30-34	3.4	3.5	3.2	3.3	3.5	3.8	3.2	3.3	2.3	2.5	2.6	2.9
35-39	3.7	3.6	4.7	2.9	4.6	4.1	4.7	2.9	2.9	2.7	3.0	3.4
40-44	4.3	3.6	5.0	4.1	4.1	3.7	5.0	4.1	2.7	2.7	3.9	3.6
45-49	4.5	4.0	4.3	4.1	3.3	3.3	4.3	4.1	2.5	2.7	3.6	3.6
50-54	3.7	3.8	5.4	4.4	2.8	2.8	5.4	4.4	2.4	3.0	3.5	4.0
55-59	4.0	3.2	4.2	3.1	2.2	2.1	4.2	3.1	2.5	4.0	3.2	4.0
60-64	2.4	1.8	3.2	1.4	1.6	1.6	3.2	1.4	3.3	4.0	3.2	3.1
65-69	1.5	.8	1.5	1.0	1.2	1.3	1.5	1.0	3.8	4.1	3.1	2.7
70-74	.7	.7	1.6	.5	.9	1.0	1.6	.5	2.8	3.2	2.4	2.5
75+	.5	1.1	.5	.8	.5	1.7	.5	.8	1.4	4.0	1.2	2.9
Total Population	5,400		310		108,100		2,750		31,900		10,500	

Source: SRI International

Table A-5

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR SOUTHERN CALIFORNIA COUNTIES AND CALIFORNIA, 1980

Age Group	Inyo		Kern		Los Angeles		Orange		Riverside		San Bernardino		San Diego		Ventura		California	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0- 4	3.4%	3.2%	4.7%	4.5%	4.1%	3.9%	3.8%	3.6%	3.9%	3.7%	4.2%	4.1%	3.8%	3.6%	4.1%	4.0%	3.9%	3.7%
5- 9	3.3	3.1	3.9	3.7	3.3	3.2	3.5	3.4	3.7	3.5	4.0	3.8	3.6	3.4	4.3	4.1	3.5	3.3
10-14	3.5	3.4	4.2	4.0	3.9	3.8	4.0	3.9	3.8	3.7	4.3	4.1	3.6	3.5	4.7	4.5	3.9	3.8
15-19	4.0	4.0	4.6	4.6	4.2	4.2	4.6	4.4	4.3	4.2	4.8	4.6	5.7	4.2	5.2	5.0	4.5	4.3
20-24	3.6	3.9	4.6	4.5	4.1	4.3	4.5	4.4	4.1	4.1	5.0	4.5	6.5	4.4	4.0	3.8	4.6	4.3
25-29	3.9	3.9	4.3	4.4	4.4	4.4	4.6	4.5	3.9	4.1	4.1	4.1	4.6	4.3	4.0	4.0	4.4	4.3
30-34	4.2	4.1	3.6	3.6	4.5	4.4	4.6	4.6	3.4	3.4	4.0	4.0	4.5	4.2	4.3	4.4	4.4	4.3
35-39	3.2	3.0	3.1	3.2	3.8	3.6	3.9	3.9	3.0	3.0	3.4	3.4	3.5	3.4	3.7	3.8	3.7	3.6
40-44	2.8	2.8	2.5	2.6	3.1	2.9	3.2	3.2	2.7	2.8	2.6	2.7	2.6	2.6	3.1	3.0	3.0	2.9
45-49	2.8	2.7	2.4	2.5	2.8	2.7	2.8	2.8	2.5	2.6	2.5	2.5	2.5	2.4	2.8	2.7	2.7	2.7
50-54	3.1	2.8	2.4	2.5	2.6	2.6	2.6	2.5	2.4	2.6	2.3	2.4	2.2	2.2	2.4	2.4	2.5	2.5
55-59	3.0	3.0	2.4	2.6	2.6	2.6	2.5	2.5	2.4	2.7	2.2	2.5	2.2	2.4	2.3	2.3	2.5	2.6
60-64	2.9	2.9	2.1	2.2	2.0	2.0	1.9	1.9	2.1	2.4	1.9	2.1	2.0	2.1	1.6	1.7	2.0	2.1
65-69	2.8	2.7	1.8	2.0	1.5	1.6	1.2	1.5	1.8	2.3	1.6	1.9	1.6	2.0	1.3	1.6	1.6	1.8
70-74	1.7	2.1	1.3	1.5	1.2	1.6	.9	1.3	1.6	2.3	1.2	1.6	1.3	1.7	.9	1.2	1.2	1.6
75-79	1.0	1.3	.8	1.0	.7	1.3	.5	.9	1.4	1.9	.8	1.1	.7	1.0	.5	.8	.7	1.1
80-84	.5	.7	-	.6	-	.9	-	.6	.9	1.2	-	.7	-	.6	-	.5	-	.7
85+	-	.5	-	-	-	.7	-	-	.5	.8	-	.5	-	.5	-	-	-	.6
Total Population	18,100		378,458		7,142,264		1,938.846		626,804		780,042		1,804,105		503,432		22,798,853	
Median Age	34.06		28.76		31.11		30.00		31.96		29.05		29.34		28.9[illegible]		30.79	

Source: California Department of Finance

Table A-6

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR
SOUTHERN CALIFORNIA COUNTIES AND CALIFORNIA, 1990

Age Group	Inyo Male	Inyo Female	Kern Male	Kern Female	Los Angeles Male	Los Angeles Female	Orange Male	Orange Female	Riverside Male	Riverside Female	San Bernardino Male	San Bernardino Female	San Diego Male	San Diego Female	Ventura Male	Ventura Female	California Male	California Female
0- 4	3.8%	3.6%	4.7%	4.5%	4.3%	4.1%	3.9%	3.7%	4.1%	3.9%	4.4%	4.2%	3.8%	3.7%	4.5%	4.3%	4.0%	3.9%
5- 9	3.7	3.5	4.8	4.6	4.2	4.0	3.8	3.7	4.1	3.9	4.4	4.2	3.9	3.7	4.3	4.1	4.0	3.8
10-14	3.1	2.9	4.3	4.1	3.7	3.5	3.3	3.2	3.6	3.4	4.0	3.8	3.5	3.4	3.8	3.6	3.6	3.4
15-19	2.7	2.7	3.3	3.2	2.9	2.9	3.0	3.0	3.2	3.1	3.6	3.4	4.4	3.2	3.6	3.5	3.3	3.1
20-24	2.4	2.6	3.4	3.3	3.5	3.6	3.4	3.3	3.2	3.2	3.9	3.5	5.1	3.4	3.2	3.1	3.7	3.4
25-29	3.6	3.7	4.0	4.1	4.2	4.2	4.1	4.0	3.7	3.8	4.0	4.1	4.1	3.8	4.2	4.2	4.1	4.0
30-34	4.7	4.9	4.3	4.3	4.2	4.3	4.4	4.4	3.9	4.0	4.3	4.2	4.1	3.9	4.4	4.3	4.2	4.2
35-39	4.6	4.6	4.0	4.0	4.1	4.1	4.5	4.4	3.8	3.9	4.0	4.0	4.3	4.2	4.2	4.2	4.2	4.2
40-44	4.1	4.1	3.1	3.2	4.1	4.0	4.3	4.3	3.3	3.3	3.7	3.7	4.1	4.0	3.8	4.0	4.1	3.7
45-49	2.9	2.8	2.6	2.7	3.3	3.1	3.3	3.4	2.9	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.3	3.2
50-54	2.4	2.5	2.1	2.2	2.6	2.4	2.6	2.6	2.6	2.6	2.2	2.3	2.1	2.2	2.5	2.5	2.5	2.4
55-59	2.5	2.5	1.9	2.1	2.2	2.1	2.2	2.3	2.3	2.4	2.0	2.0	1.9	2.0	2.2	2.1	2.1	2.2
60-64	2.6	2.6	1.8	2.1	1.8	1.9	2.1	2.2	2.1	2.4	1.7	2.0	1.7	1.9	1.8	1.9	1.9	2.0
65-69	2.3	2.6	1.7	2.1	1.7	1.8	2.0	2.3	1.9	2.4	1.6	1.9	1.8	2.2	1.8	2.0	1.8	2.1
70-74	1.8	2.2	1.3	1.7	1.2	1.4	1.3	1.6	1.5	2.0	1.1	1.5	1.4	1.8	1.1	1.4	1.3	1.6
75-79	1.3	1.6	.9	1.3	.8	1.1	.7	1.0	1.1	1.7	.8	1.2	.8	1.3	.6	1.0	.8	1.2
80-84	.5	.9	.5	.9	.5	.9	-	.7	.7	1.3	.4	.8	.5	.9	-	.6	.5	.9
85+	-	.6	-	.6	-	.9	-	.5	.6	1.2	-	.6	-	.6	-	.5	-	.7
Total Population	22,175		436,961		7,631,409		2,399,573		798,437		938,658		2,262,795		658,391		26,292,028	
Median Age	36.24		30.96		32.77		34.26		34.37		31.44		32.47		32.05		33.33	

Source: California Department of Finance

Table A-7

PERCENTAGE AGE-SEX DISTRIBUTIONS FOR
SOUTHERN CALIFORNIA COUNTIES AND CALIFORNIA, 2000

Age Group	Inyo		Kern		Los Angeles		Orange		Riverside		San Bernardino		San Diego		Ventura		California	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0- 4	3.0%	2.9%	4.0%	3.8%	3.7%	3.6%	3.2%	3.0%	3.6%	3.4%	3.8%	3.6%	3.4%	3.2%	3.7%	3.5%	3.5%	3.3%
5- 9	3.3	3.1	4.2	4.0	3.8	3.7	3.4	3.3	3.7	3.5	4.0	3.8	3.5	3.3	4.0	3.8	3.7	3.5
10-14	3.5	3.4	4.5	4.3	4.0	3.8	3.6	3.5	3.9	3.7	4.2	4.0	3.7	3.5	4.2	4.0	3.8	3.7
15-19	3.2	3.1	4.2	4.1	3.7	3.7	3.5	3.4	3.7	3.6	4.0	3.9	4.6	3.6	3.8	3.7	3.8	3.6
20-24	2.2	2.3	3.5	3.5	3.4	3.5	2.9	2.9	3.1	3.1	3.7	3.3	4.7	3.4	2.7	2.6	3.5	3.2
25-29	2.6	2.6	2.9	2.9	3.1	3.1	2.8	2.8	2.9	2.9	3.1	3.1	3.2	3.0	3.0	3.0	3.0	3.0
30-34	3.3	3.3	3.2	3.2	3.7	3.7	3.4	3.4	3.1	3.1	3.4	3.4	3.2	3.1	3.6	3.6	3.4	3.4
35-39	4.3	4.4	3.8	3.9	4.0	4.0	4.1	4.1	3.7	3.7	4.0	4.0	3.8	3.7	4.4	4.4	4.0	4.0
40-44	4.9	5.0	3.9	4.0	3.9	3.9	4.3	4.2	3.7	3.8	4.1	4.0	3.8	3.8	4.1	4.1	4.0	4.0
45-49	4.4	4.4	3.6	3.6	3.7	3.7	4.1	4.1	3.7	3.8	3.6	3.7	3.9	3.9	3.7	3.7	3.9	3.9
50-54	3.8	3.8	2.7	2.9	3.5	3.4	3.7	3.7	3.0	3.2	3.2	3.3	3.6	3.6	3.2	3.4	3.6	3.6
55-59	2.7	2.7	2.2	2.4	2.7	2.6	2.9	3.0	2.6	2.8	2.4	2.6	2.5	2.6	2.5	2.7	2.7	2.7
60-64	2.1	2.4	1.7	1.9	1.9	1.9	2.2	2.3	2.2	2.4	1.7	1.9	1.8	2.0	2.0	2.1	1.9	2.1
65-69	2.0	2.2	1.4	1.8	1.5	1.6	1.8	2.1	1.8	2.1	1.4	1.7	1.6	1.9	1.7	2.0	1.6	1.8
70-74	1.7	2.0	1.2	1.6	1.1	1.4	1.5	1.8	1.5	2.0	1.1	1.5	1.2	1.6	1.3	1.6	1.2	1.6
75-79	1.1	1.6	.9	1.5	.9	1.3	1.1	1.6	1.1	1.8	.8	1.3	1.0	1.6	.9	1.3	1.0	1.4
80-84	.6	1.0	.5	1.0	.5	.8	.5	.8	.7	1.2	-	.8	.6	1.0	-	.7	.5	.9
85+	-	.8	-	.8	-	.9	-	.6	.6	1.3	-	.8	-	.8	-	.6	-	.8
Total Population	25,840		475,951		8,045,532		2,758,064		910,027		1,084,798		2,640,774		807,277		29,287,021	
Median Age	39.78		33.23		34.78		38.02		37.04		34.15		35.36		35.53		36.04	

Source: California Department of Finance

Appendix B

SUPPLEMENTAL DATA ON MINERAL
PRODUCTION AND RESERVES

Table B-1

CALIFORNIA DESERT, UNITED STATES, AND WORLD SOURCES
OF SELECTED MINERALS
(In Order of Output)

	Major CDCA Suppliers,* 1974 (by county)	Major U.S. Suppliers,* 1974 (by state)	Major World Suppliers,† 1975 (by county)
Asbestos	None	California	USSR, Canada, South Africa, China, Rhodesia
Barite	None	Nevada, Arkansas, Missouri	U.S.
Boron	Kern, Inyo, San Bernardino	California	U.S., Turkey, USSR, Argentina, China
Cement	San Bernardino, Riverside, Kern†	California, Michigan, Pennsylvania, Texas	USSR, U.S., Japan, Italy, West Germany
Clays	Imperial, Riverside, Kern†	Georgia, Texas, Ohio, North Carolina	USSR, U.S., Canada, U.K., Japan
Copper	Inyo, San Bernardino	Arizona, Utah, New Mexico, Montana	U.S., Chile, USSR, Canada, Zambia
Diatomite	None	California, Nevada, Washington	U.S., USSR, France, Denmark
Feldspar	San Bernardino	North Carolina, Connecticut, Georgia, California	U.S., West Germany, USSR, Norway, France
Gold	San Bernardino	South Dakota, Nevada, Utah, Arizona	Republic of South Africa, USSR, Canada, U.S., South Rhodesia
Gypsum	Imperial, San Bernardino Kern	California, Michigan, Texas, Iowa	U.S., France, Canada, USSR, Spain
Iron ore	Riverside, San Bernardino	Minnesota, Michigan, California, Wyoming	USSR, Australia, Brazil, U.S., China

Table B-1 (Continued)

	Major CDCA Suppliers,* 1974 (by county)	Major U.S. Suppliers,* 1974 (by state)	Major World Suppliers,† 1975 (by county)
Lead	Inyo, San Bernardino	Missouri, Idaho, Colorado, Utah	U.S., USSR, Canada, Australia, China
Lime	San Bernardino, Imperial	Ohio, Missouri, Pennsylvania, Texas	USSR, U.S., West Germany, Japan, Poland
Lithium	San Bernardino	North Carolina, Nevada, California	U.S., USSR, China, Rhodesia, S.W. Africa
Molybdenum	Inyo	Colorado, Arizona, New Mexico, Utah	U.S., Canada, Chile, USSR, China
Perlite	Inyo	New Mexico, Arizona, California, Nevada	U.S., USSR, Italy, Greece
Pumice	Inyo, Kern	Oregon, California, Arizona, New Mexico	U.S., Italy, West Germany, Greece, France
Rare-earth minerals	San Bernardino	California, Georgia, Florida	U.S., Australia, India, Malaysia, Brazil
Salt	Imperial, Kern San Bernardino‡	Louisiana, Texas, New York, Ohio	U.S., China, USSR, Mexico, India
Sand and gravel	Los Angeles, Riverside, San Bernardino, Imperial, San Diego, Kern, Inyo	Alaska, California, Michigan, Illinois, Texas	U.S., France, Mexico, Canada, West Germany
Silver	Inyo, Kern, San Bernardino	Idaho, Arizona, Montana, Utah	USSR, Canada, Mexico, Peru, U.S.
Sodium carbonate (natural)	San Bernardino	Wyoming, California	U.S., USSR, France, West Germany, Japan
Sodium sulfate (natural)	San Bernardino, Kern	California, Colorado, Nevada	
Stone	San Bernardino, Kern, Riverside, Imperial, Inyo	Pennsylvania, Illinois, Texas, Florida	U.S., Belgium, Mexico, Australia, West Germany

Table B-1 (Concluded)

	Major CDCA Suppliers,* 1974 (by county)	Major U.S. Suppliers,* 1974 (by state)	Major World Suppliers,† 1975 (by county)
Talc and related minerals	Inyo, San Bernardino	New York, Montana, Vermont, Texas	Japan, U.S., USSR, Korea, France
Tungsten	Inyo, San Bernardino	California, New Mexico, Colorado	China, USSR, U.S., Bolivia, Korea
Uranium	--	New Mexico, Utah Wyoming, Colorado	U.S., South Africa, Canada, France, Nigeria
Zeolite§	San Bernardino	Arizona, Nevada, California	Japan
Zinc	Inyo, San Bernardino	New York, Missouri, Tennessee, Colorado	Canada, USSR, U.S., Australia, Peru

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*Bureau of Mines, 1974 Minerals Yearbook, Vol. II, Area Reports: Domestic (1974).

†Bureau of Mines, Minerals in the U.S. Economy: 10 Year Supply-Demand Profiles (1977).

‡Not necessarily in order of output.

§Industrial Minerals and Rocks, 4th Edition (1975).

Table B-2

MINED MINERALS--U.S. AND WORLD RESERVES AND RESOURCES[*]

	Units	1977 Reserves		Identified Resources	
		United States	World	United States	World
Asbestos	million ST	4	96	7	142
Barite	million ST	65	200	250	2,000
Boron (ore)	million ST[†]	350	1,100	Large	Extensive
Cement		Great	Great	Great	Great
Clays	million ST	450[†]		19,730	92,260
Copper	million ST	93	503	410[†]	2,050[†]
Diatomite	million T	600[†]	2,000[†]	Unknown	Unknown
Feldspar	million ST	600	1,000	Vast	Vast
Gold	million TO[‡]	110	1,215	240	1,900
Gypsum	million ST	350	2,000	Large	Large
Iron ore (recoverable)	billion ST	4	103	30	260
Lead	million ST	28	136	119[†]	1,500
Lime		Vast	Vast	Vast	Vast
Lithium minerals	thousand ST	407	2,233	3,200	6,800
Manganese	million ST	N.A.[§]	6,000	Large	Very large
Molybdenum	billion lb	8	20	37	70
Perlite	million ST	200[†]	1,010[†]	650	3,630[†]
Pumice and related minerals	million ST	1,250[†]	2,065[†]	10,250[†]	13,120[†]
Rare-earth minerals	thousand ST	5,000	7,700	26,000[†]	20,000
Salt	trillion tons	61[†]	Vast	Vast	Vast
Sand and gravel	billion tons	65[†]	N.A.	Inexhaustible	Inexhaustible
Silver	million TO	1,510	6,100	5,700[†]	22,630[†]
Sodium carbonate	million ST	30,000	N.A.	17,000[†]	17,000[†]
Sodium sulfate	million ST	45[†]	160[†]	430	490
Stone		Vast	Vast	Vast	Vast
Talc and related minerals	million tons	150	330	330[†]	1,300[†]
Tungsten	million lb	275	4,000	958[†]	11,358[†]
Uranium (at $30/lb)	thousand ST	680	2,500	356[†]	1,000
Vanadium	million lb	230	21,400	N.A.	62,000
Zinc	million ST	30	175	130[†]	2,000

[*] Mineral Commodity Summaries, 1978 (1977).
[†] U.S. Bureau of Mines, Mineral Facts and Problems (1973).
[‡] ST = short tons; TO = troy ounces.
[§] N.A. = not available.

Table B-3

U.S. AND WORLD PRODUCTION OF MINERALS
FOUND IN THE CDCA, 1977

	Production, 1977*		
	United States	World	Units
Antimony	770	73,270	ST
Mined asbestos	105	5,507	thousand ST
Barite	1,549	5,874	thousand ST
Boron	1,436	2,925†	thousand ST
Cement	80,600	802,000	thousand ST
Clays	56,251	442,000	thousand ST
Mined copper	1,490	8,320	thousand ST
Diatomite	637	1,920	thousand ST
Feldspar	765	2,950	thousand ST
Gold	1,020	38,490	thousand TO
Crude gypsum	13,900	79,300	thousand ST
Iron ore	57,000	840,000	thousand ST
Mined lead	589	4,279	thousand ST
Lime	19,800	116,291	thousand ST
Lithium minerals	4,000	4,530†	ST
Manganese	0	26,400	--
Molybdenum	120,000	200,700	thousand lb
Crude perlite	775	1,983‡	thousand ST
Pumice and volcanic cinder	4,109	17,309	thousand ST
Rare-earth minerals	22,482§	29,708§	ST
Salt	42,934	184,134	thousand ST
Sand and gravel	898,000	N.A.	thousand ST
Mined silver	37,400	318,400	thousand TO
Natural sodium carbonate	6,138	6,274	thousand ST
Natural sodium sulfate	647	2,165	thousand ST
All stone	916,000	8,000,000	thousand ST
Talc and pyrophyllite	1,054	6,074	thousand ST
Tungsten, mined	7,000	94,640	thousand lb
Uranium concentrate	14,000	33,750†	ST
Vanadium	12,400	62,300	thousand lb
Zinc, mined	463	6,803	thousand ST

*U.S. Bureau of Mines, Mineral Commodity Summaries, 1978; data are 1977 estimates.

†Excludes central economy countries.

‡1976 data.

§U.S. Bureau of Mines, Mineral Facts and Problems (1973).

Table B-4

MINED MINERALS--U.S. AND WORLD DEMAND, 1974-2000*

		1974 Demand		2000 Demand		Cumulative--1974-2000	
	Units	U.S.	World	U.S.	World	U.S.	World
Antimony	thousand ST	20	57	49	141	864	2,781
Asbestos	thousand ST	846	3,689	1,114	10,544	25,600	188,100
Boron	thousand ST	105	328	340	1,030	5,300	16,200
Cement†	thousand ST	86,377	780,344	220,000	1,590,000	4,000,000	31,100,000
Clays	thousand ST	59,000	545,000	181,000	1,061,000	2,870,000	20,270,000
Copper	thousand ST	1,953	7,236	4,200	22,200	78,000	353,000
Diatomite	thousand ST	478	1,546	1,785	7,185	26,400	97,700
Feldspar	thousand ST	833	2,500	2,000	8,000	35,100	124,600
Gold	million TO	4	26	15	58	224	1,056
Gypsum	thousand ST	19,000†	73,000	35,000	125,000	680,000	2,540,000
Iron ore	million ST	91	566	129	1,129	2,900	21,500
Lead	thousand ST	931	3,392	1,530	7,570	31,500	136,500
Lime	thousand ST	22,000	119,000	43,000	239,000	825,000	4,526,000
Lithium minerals and yttrium	thousand ST	5	8	14	29	217	430
Molybdenum	million lb	76	200	193	586	3,320	9,460
Perlite	thousand ST	535	1,731	1,500	5,350	24,200	85,100
Pumice	thousand ST	4,000	15,000	10,000	39,000	180,000	663,000
Rare-earth minerals	thousand ST	16	27	34	74	625	1,233
Salt	thousand ST	49,000	172,000	137,000	756,000	2,265,000	10,485,000
Sand and gravel	million ST	978	6,941	2,090	17,290	39,000	302,000
Silver	million TO	124	374	230	680	4,500	13,500
Sodium carbonate	thousand ST	7,000	24,000	16,000	63,000	289,000	1,066,000
Sodium sulfate†	thousand ST	1,727	N.A.‡	N.A.	N.A.	N.A.	N.A.
Crushed stone	million ST	1,041	5,070	2,500	14,800	43,900	241,100
Talc	thousand ST	1,064	5,064	2,150	13,650	40,000	227,500
Tungsten	million lb	16	85	49	174	780	3,270
Uranium	ST	8,000	18,300	69,500	193,200	1,073,000	2,876,000
Vanadium	thousand ST	8	28	33	90	483	1,429
Zinc	thousand ST	1,464	6,400	3,050	12,350	57,300	239,500

*U.S. Bureau of Mines, Mineral Trends and Forecasts (1976).
†U.S. Bureau of Mines, Mineral Facts and Problems (1975).
‡N.A. = not available.